THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXV. No. 891.] LONDON, JUNE 8, 1880. [32ND YEAR. Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
ERITH,
OFFICES:
2, CROSBY SQUARE,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
SEVERAL PRIZE MEDALS. ESTABLISHED OVER 20 YEARS.
These Paints are now used by all the London Gas Companies and most of the principal Country Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
PROPRIETORS: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
WORKS: BRIXHAM, TORBAY.

TUBES.
Tubes and Fittings for Gas, Steam, Water, and Hydraulic purposes, plain, galvanized, white enamelled inside, or coated by Dr. Angus Smith's process, or oxidized by Professor Barff's patent process. Gas-fitters tools, brass cocks, &c.
JOHN SPENCER,
VULCAN TUBE WORKS,
WEST BROMWICH, STAFFORDSHIRE,
AND
97, CANNON STREET, LONDON.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
JOS. COWEN & CO. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
MANUFACTURERS OF
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
HEAD LONDON OFFICE:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
LICENSEES AND MANUFACTURERS OF
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
ESTABLISHED 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE,
From ½ to 40 H.P. ind.

See Page 862.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

GEORGE GLOVER AND CO.,
PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
AND MANUFACTURERS OF
IMPROVED DRY GAS-METERS.
GOLD MEDAL. HIGHEST AWARD.

INTERNATIONAL EXHIBITION,
SYDNEY, 1880.
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.
1, LANCASTER AVENUE, MANCHESTER.
Foreign Agents: DAHL BROS. Copenhagen; A. FAAS & CO., Frankfort-on-Maine; W. HOVEN & SON, Rotterdam; COPLAND & M'LAREN, Montreal; A. DEMPSTER, 57, Elizabeth Street, Melbourne.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

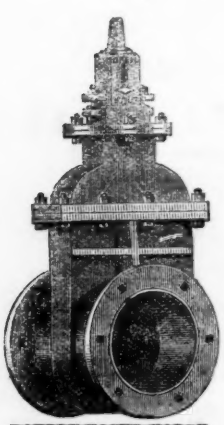
GAS APPARATUS;

CONTRACTORS FOR THE

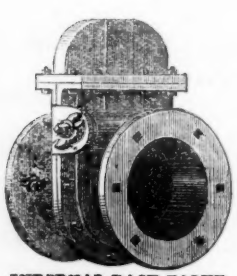
ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

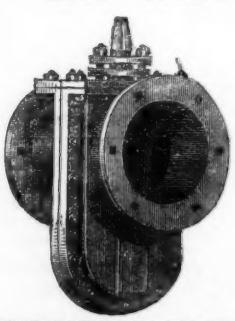
C. & W. WALKERS' GAS-VALVES.



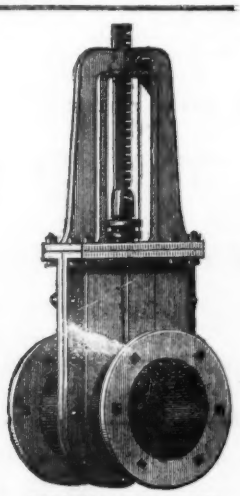
DOUBLE-FACED VALVE SPECIALLY FOR PURIFIERS.



INTERNAL RACK-VALVE WITH STEEL PINION, FOR GENERAL USE.



UNDERGROUND SCREW-VALVE FOR SHALLOW STREET-MAINS.



ORDINARY RACK AND PINION VALVE.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.,

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES. 57, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE

RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4 inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT LIGHTHOUSE GAS-BURNERS,

For Street Lighting and the Illumination of Large Halls, Factories, Ship Yards, &c., where Powerful Light is required

These Burners have been adopted by a School Board, having large school-rooms in charge, because of their high illuminating power and the facilities they give for perfect ventilation. The actinic power of these Burners is such that they are used successfully for Photography and Photo-Lithography.

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., Gas Engineers, 19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

HANNA, DONALD, & WILSON,

(ESTABLISHED 1851,)

GAS ENGINEERS & CONTRACTORS

FOR THE

ERECTION OF GAS AND WATER WORKS,

TELESCOPIC AND SINGLE-LIFT GASHOLDERS,

CAST AND WROUGHT IRON GASHOLDER-TANKS,

IMPROVED FIXED OR TRAVELLING HYDRAULIC PURIFIER-COVER LIFTERS,

PURIFIERS, CONDENSERS, SCRUBBERS, EXHAUSTERS, AND PUMPING-ENGINES,

TAR AND LIQUOR PUMPS, HYDRAULIC SLUICE AND SLIDE VALVES, LAMP-POSTS AND HYDRANTS COMBINED.

DESIGNS AND ESTIMATES SUPPLIED ON APPLICATION.

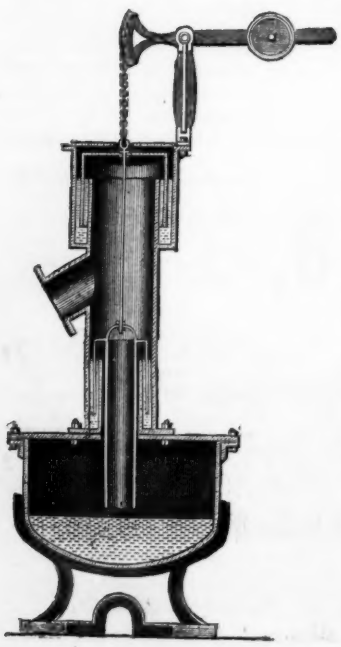
London Office: 9, FENCHURCH STREET, E.C.

ABERCORN FOUNDRY & ABBEY WORKS, PAISLEY, N.B.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



The following Testimonials, as to five years constant working of this Patent Removable Dip, have been received:—

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Jan. 15, 1874.

Messrs. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Dec. 30, 1879.

Messrs. CHANDLER and SONS.

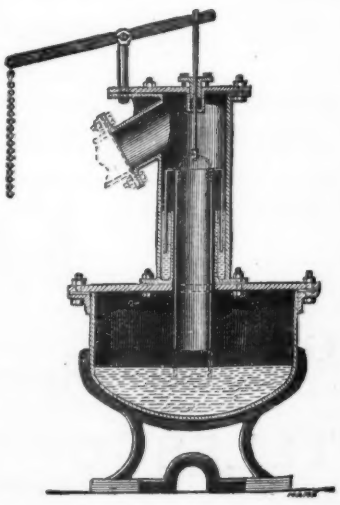
DEAR SIRS,

In reply to your inquiry, it is with very much pleasure thatI endorse every word of my letter of Jan. 15, 1874; and I may add that from the date the Patent Dips were fitted, they have worked perfectly, and there is very little carbon deposited in the retorts, in consequence of the lower pressure.

Yours faithfully,

(Signed) W. CRICKMAY,

Memb. Soc. Engineers.



APPLICATIONS TO BE MADE TO

Messrs. CHANDLER & SONS,

104, NEWINGTON CAUSEWAY, S.E.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER,

FOR

GAS PURIFICATION,

TAKES OUT EVERY TRACE OF AMMONIA AND A LARGE QUANTITY OF CARBONIC ACID AND SULPHURETTED HYDROGEN BY ONCE PASSING THROUGH THE MACHINE.

AMMONIACAL LIQUOR OBTAINED OF ANY REQUIRED STRENGTH.

The Cost of the Machine defrayed by the Ammonia obtained in Twelve Months. It requires very little attention, and cannot get out of order.

THESE MACHINES HAVE BEEN SUPPLIED TO THE FOLLOWING GAS-WORKS:—

	Feet per Day.
The Gaslight Company, London—	
Beckton	5,000,000
Bromley	7,000,000
St. Pancras	3,000,000
Bradford Corporation	1,000,000
Bremen	150,000
Buxton Local Board	250,000
Dukinfield Local Board	500,000
Driffield Company	100,000
Goole Company	250,000
Glossop Company	300,000
Holywood Company	125,000
Heywood Local Board	600,000
Leeds Corporation	2,000,000
Leominster Company	150,000
Maidstone Company	1,000,000
Phœnix Company, Greenwich	2,500,000
" " Vauxhall	3,000,000
Woolwich Equitable Company	400,000
Yeadon Company	500,000

AND MANY ARE IN COURSE OF CONSTRUCTION;

Among others, four, for 3 million feet per day each, for the Corporation of Leeds; three, for 1¾ million feet each, for the Corporation of Salford; three, for 5 million feet, for The Gaslight and Coke Company, London; one, for 3 million feet, for the London Gas Company, Nine Elms, &c. &c.

TESTIMONIALS.

Messrs. KIRKHAM, HULETT, and CHANDLER. *Engine-Works, Millbank, Westminster, S.W., March 5, 1879.*

Gentlemen,—In accordance with your instructions, I have taken diagrams from Vertical Engine driving your Patent Horizontal Washer-Scrubber to purify 60,000 feet of gas per hour on the works of The Gaslight Company at King's Cross, and find the following results, viz.:—

Horse power required to drive engine, shafting, and gearing alone = 0·398
Total horse power with washer on = 1·721
Absolute horse power required to drive Washer-Scrubber = 1·323

(Signed) THOS. HORN.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Aug. 12, 1879.*

Gentlemen,—In reply to your inquiry, one of your Patent Scrubber-Washers to purify 100,000 cubic feet per hour was put into operation at these works on the 1st of June. At the same moment the whole of our Scrubbers, equal to 28,000 cubic feet, were thrown out of use, leaving your Washer the whole work of freeing the gas from Ammonia. This it has done to perfection up to date. With 10 gallons of water to each ton of coal carbonized passing through it we get a clean test at the seventh chamber, leaving four chambers margin for extra work. The mean quantity of Ammonia in the inlet (fixed and free) obtained from a large number of tests was 241 grains per 100 feet of gas. On the outlet—Free Ammonia—Nil. The quantity of water used is 10 gallons per ton of coal carbonized. The strength of liquor as follows:—

Chamber No.	1	2	3	4	5	6	7	8	9	10	11
Strength of liquor—ounces	Nil.	Nil.	Nil.	Nil.	0·4	1·0	2·2	3·5	5·5	8·25	12·5

We are working five revolutions per minute. It takes out all the free Ammonia, reduces the carbonic acid and sulphuretted hydrogen 30 per cent., requires a very small amount of power to drive, and altogether is, in my opinion, the best machine for the purpose yet invented, and will, I feel confident, ere long, entirely supersede the Scrubbers of to-day. I am glad to find you are going to fix one of these Washers at our Vauxhall works. (Signed) P. J. WATES, Engineer.

For Results and other Testimonials, see next week's Journal.

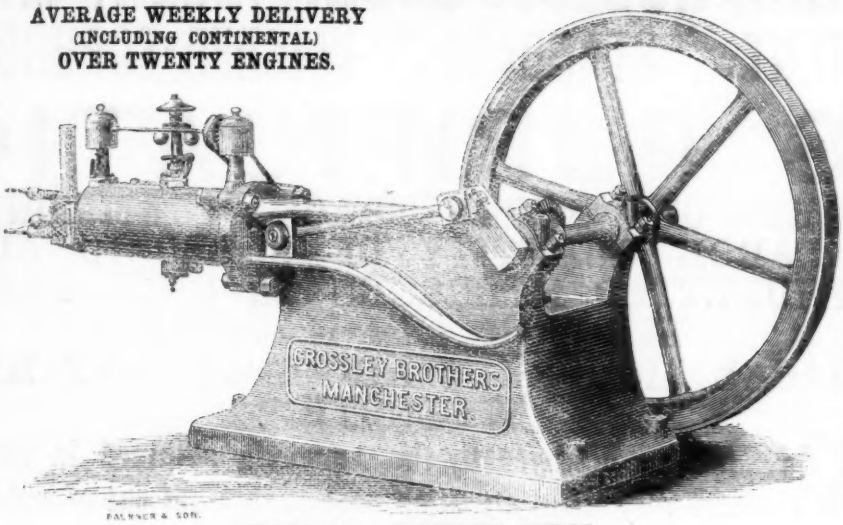
FOR FURTHER PARTICULARS AND TESTIMONIALS, ADDRESS MESSRS.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.



Over 2500 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877,)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. SIZES { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¾ 1½ 2½ 4 9 12 18 24 } OFFERED. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

WORKS AND HEAD OFFICES: Gt. Marlbro' St., Gloster St.

CROSSLEY BROTHERS, MANCHESTER.

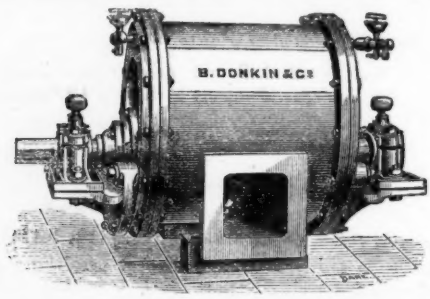
LONDON HOUSE: 116, Queen Victoria St., E.C

PORTBURY, PATERSON, & CO.,

WET AND DRY GAS-METER MANUFACTURERS.

STATION-METERS, PRESSURE-GAUGES, &c., of the Highest Excellence only.

VICTORIA METER-WORKS, EXETER.



NEW PATENT GAS-EXHAUSTERS.

[J. BEALE'S.]

MESSRS. B. DONKIN & Co. possess the sole right to manufacture J. Beale's Exhausters under his new patent.

MADE WITH TWO OUTSIDE BEARINGS AND LATEST IMPROVEMENTS.

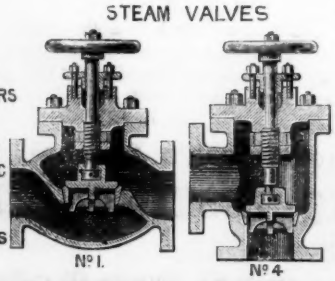
ALSO MANUFACTURERS OF

IMPROVED GAS AND WATER VALVES, STEAM-ENGINES, &c., &c.

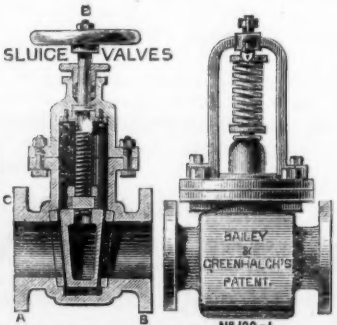
B. DONKIN & Co., BERMONDSEY, LONDON.

STEAM VALVES

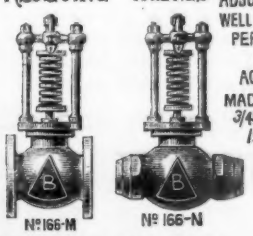
VALVES
RECORDERS
GAUGES
STEAM PUMPS
HYDRAULIC LIFTS
BRASS & IRON COCKS



SLUICE VALVES



WATER PRESSURE REDUCING VALVES



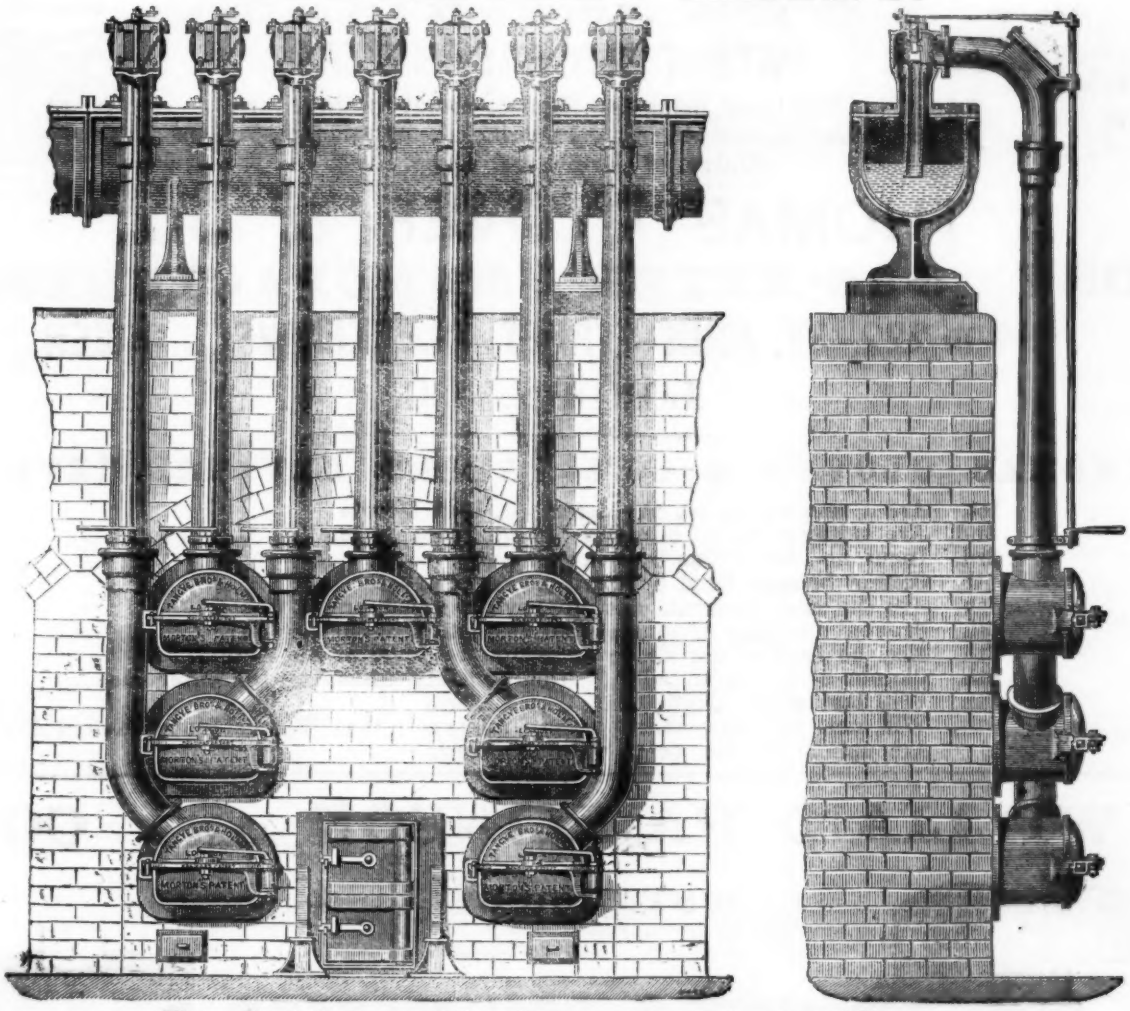
ADJUSTABLE WELL MADE PERFECT IN ACTION MADE FROM 3/4 IN. TO 15 INCHES BORE

BAILEY AND GREENHALGH'S Patent REDUCING VALVES FOR WATER PRESSURE, with or without Flanges in Iron or Brass.

WE KEEP A LARGE STOCK OF VALVES READY FOR IMMEDIATE DELIVERY.

W. H. BAILEY & CO., Valve and Cock Makers, General Brass Founders for Gas and Water Works, ALBION WORKS, SALFORD, MANCHESTER.

HOLMAN'S PATENT
NON-PRESSURE VALVULAR SEAL-PIPES
FOR
HYDRAULIC MAINS.



The salient features of the above arrangement are as follows:—

1. The Seal is instantaneously opened and closed from the stage by the stokers.
2. There are only two positions for the actuating lever: one when the Seal is opened during the period of carbonization, the other when it is closed for drawing and charging the retort.
3. The retort can never be blocked, because the port directing the gas *through* the Seal is always opened, and the port permitting the gas to *pass* the Seal *direct* into the hydraulic main is also open while the retort is at work.
4. The manager and stokers can always see at a glance, by the position of the lever, whether the retort is duly unsealed while carbonizing its charge.
5. There are no extraneous seals, stuffing-boxes, hinges, screws, chains, pulleys, springs, teeth, or other complication belonging to the valves; they are made plain and strong for rough use, and will last many years without renewal.
6. The valve faces are always covered and never separated, hence no foreign matter can put them out of action.
7. They are positive, reliable, interchangeable, free from all the uncertainty of automatic arrangements, and low in price.
8. No extra pipes or connections are required, because the Valvular Seal-pipe is self-contained in the single branch of the ascension-pipe, which stands on the hydraulic main, and is easily accessible by removing an ordinary cover secured by two bolts only.

(238) TWO HUNDRED AND THIRTY-EIGHT HOLMAN'S PATENT VALVULAR SEAL-PIPES are being fitted to the Hydraulic Mains at the Radford Station of the Corporation Gas-Works at Nottingham.

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They are to be fitted to the Hydraulic Mains of the New Retort-House at the LONDON GAS-WORKS, and at other large stations.

Mr. MORTON writes in the following terms, under date of Feb. 3, 1880:—

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3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
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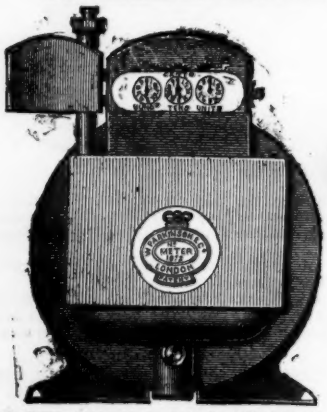

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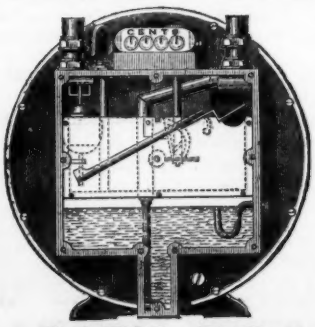

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CONTENTS.

Circular to Gas Companies:— PAGE
The Status of the British Association of Gas Managers . . . 865
The Liability of Employers for Accidents to their Workmen . . . 866
The Manchester Gas Committee and the Council . . . 866
Leeds Corporation Gas Supply . . . 867
Appropriation of Gas Profits at Rotherham . . . 867
Gas Meters as *Primâ Facie* Evidence of Consumption . . . 867
Portable Gas for Dublin . . . 867
Water and Sanitary Notes:—
The Metropolitan Water Question referred to a Select Committee . . . 868
The Home Secretary and the Vestry Delegates . . . 868
The Water Companies View of the Question . . . 868
Earl Camperdown and the Water Companies Rating Powers . . . 868
Water Rates v. Gas Bills . . . 869
Leading Article:—
River Water . . . 869
Communicated Article:—
The Action of the Blowpipe Considered with Reference to the Principles of Gas Illumination. By Mr. R. H. Patterson, F.S.S. . . . 870
Correspondence:—
Mr. Niven's Paper on Corrections for Temperature and Pressure . . . 871
The Use of Gaseous Fuel . . . 872
Gas Pumping Apparatus at Beckton and Liverpool . . . 872
Employers Liability Bill . . . 872
Parliamentary Intelligence:—
Private Bills relating to Gas, Water, &c. . . . 873
Progress of Bills in the House of Lords—London Water Supply . . . 874
Progress of Bills in the House of Commons—
The Government and the Metropolitan Water Question . . . 874
The Water Supply at London Fires . . . 875
London Water Supply . . . 875
Legal Intelligence:—
Dudley Police Court—The Dudley Gas Company and the Corporation . . . 877
Warrington Borough Police Court—What is a Domestic Supply of Water? . . . 878
Miscellaneous News:—
Metropolis Water Supply . . . 879
Burslem Town Council Gas Supply . . . 879
West of Scotland Gas Managers Association . . . 880
Reduction in the Price of Gas at Shipley . . . 881
Gas Engines for Hydraulic Work . . . 881
North Shields Water-Works Company . . . 881
Liverpool Corporation Water Accounts . . . 881
Norwood (Middlesex) Water Company, Limited . . . 881
The Liverpool Corporation (Vyrnwy) Water Scheme . . . 881
Portishead Water Company . . . 881
Rotherham Corporation Gas Supply . . . 904
Rochdale Corporation Gas Supply . . . 904

SUPPLEMENT.
British Association of Gas Managers—Inaugural Address of the Acting President, Charles Hunt, Esq. . . . 897

TO CORRESPONDENTS.

L. M.—*Thanks for information and good wishes. Shall probably soon have an opportunity of referring to the facts to which you call attention.*

T. A.—*The proceedings are rather wide of the mark as far as our readers are concerned.*

CUM MULTIS ALIIS.—*Crowded out this week.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 8, 1880.

Circular to Gas Companies.

THE Seventeenth Annual Meeting of the British Association of Gas Managers will have commenced its proceedings before this JOURNAL reaches our subscribers. The programme, which we published last week, contains material which promises to the large number of members who will doubtless attend, both interest and profit, and our expectation goes with our hope that the meeting of 1880 will prove in the truest sense a great success.

Our regret at the absence from the chair of the President for the year, Mr. John Douglas, will be generally shared. It will be remembered that when, last year, the choice fell upon Mr. Douglas, he was away on the Continent in search of health; his absence now will be the more deplored, because it seems to say that the search was unsuccessful. We hope that for the sake of the Association, of which he has been a useful and valued member, as well as for his own, he may soon be again the strong man we have known him. Under such circumstances, the Association is fortunate in having been able to fill, and that so satisfactorily, the gap created. Mr. Hunt has tried his "'prentice hand" as President of the Midland District Association, and the very able and practical character of the addresses he has delivered before the members of that Society, as also of the papers he has contributed to the Association itself, make us look with even special interest for the Inaugural Address this year. It is worthy of remark that this year, as last, the presidential chair of the parent Association is filled by one who has held like office in one of the district offshoots. There has been much speculation in our columns and elsewhere, in recent years, as to the effect likely to be produced by the formation of these district societies now established all over the country. Would they be an added strength or a source of weakness? would they prove tributaries or the contrary? It is difficult to say, so far, what, if any, has been the influence exerted. The proceedings at the meetings held have been generally of a distinctly valuable character to those who have attended or taken part in them, and anything which tends to benefit and improve the information of individual members should, and no doubt does, produce a beneficial effect upon the Association as a whole. We think, however, that it is eminently desirable that some more positive gain should result to the central and representative body from such machinery as these district associations afford. The training of presidents is doubtless a high function; but there is a higher one—that of contributing as largely as possible to maintaining and increasing the high character of the Association; thus securing that the office of President will continue to be looked up to as one of distinguished honour by all members of the profession. In his address in 1878, the President of that year made a suggestion which, though well received at the time, does not appear to have borne fruit; it was that each of the district societies should charge itself with the responsibility of contributing from among its members one paper to the annual meeting. Last year Mr. Warner amplified this idea by proposing that the Association should depute certain subjects for investigation to the branches, and receive their reports at the annual meeting. How useful might be the results of such a practice may be inferred, not only from the illustrations which Mr. Warner gave, but also from the excellent work which has been done by the Manchester District Association, in obtaining and tabulating information upon practical subjects from among its members. That the district associations should be in effect branches of the parent one, that the work in which they have been engaged during the year should produce some result, and find some record in the proceedings of the annual meeting, is clearly most desirable; and we shall rejoice if the proposals in this direction which have been repeatedly made should be referred to a representative Committee of the Association for consideration before the next annual meeting. With such a connection cordially accepted, the whole would enjoy the advantages and the strength of union; without it, the painful position might arise of the parent's pride in the growth of its offspring being dashed by fear of unnatural rivalry, and by anxious reflections upon the fate of the divided house.

Another question which has occupied much of the time and attention of the members at several of their too short meetings is that of the restrictions upon membership imposed by the present constitution. A letter which appeared in our columns last week, signed "An Assistant," stated the case very clearly from the point of view of those at present excluded. We observe that notice is given in the programme of an intention to amend the rules, and it is possible that the Committee may purpose submitting some proposition on this subject.

The formation of a class of Associates has much to recommend it, and we confess our inability to see what tangible objections can be set against them. That the class, if formed, would embrace many men of greater information and culture, and of much higher social and professional position than some of those who by right are members of the one with the more dignified name, there can be no doubt; but such is the case in many other societies, and the feeling of no sensible man would be hurt by what is simply an inevitable necessity. From the numerous body of assistants in and outside gas-works, leading draughtsmen, chemists, and others, there could be formed a class of earnest and intelligent men—the subalterns of to-day, the leaders of to-morrow—who would not only themselves derive help on their way, but who would, we feel sure, contribute much to the useful character of the Association as a whole. Such a class would, it seems to us, partake, if formed, of the characteristics of two sections of the Institution in whose house the meeting this year will be held—the Associate and the Student. There would be the same power in the hands of the Committee first, and of the general body of Members after, to determine the suitability of candidates, and under Rule 3, as amended a few years ago, there would remain to the Committee the right to nominate as members those whom the old rule excluded, and the proposed new one would relegate to the class of Associates. Radical changes in any constitution should never be made lightly; but, on the other hand, neither should they be resisted when their expediency is clearly apparent. Especially is this the case if investigation has failed to discover evil likely to result from them as a set-off against the anticipated good. Burning questions are apt to become nuisances if their consideration is over-long delayed.

We are glad to observe that the number of papers on the

programme for this year is smaller than usual. We are of opinion that the record of the annual proceedings will be at least as valuable a volume if it contains the report of full and exhaustive discussions on a comparatively limited number of subjects, as it is now, when enriched by a number of papers which the courtesy of their writers permits to be printed, though time did not admit of their being read. It is also very desirable that members taking part in discussions should be relieved as much as possible of the discomfort of feeling that their observations must be governed, not by the importance of the subject, or their own information upon it, but by the mere question of time. And this leads us to ask, has not the time arrived when the duration of this annual congress may be fairly and properly extended? The material available being amply sufficient to fill up twice the time allotted to its consideration, might not at least another day be given to the work? Members who leave their business to attend the meetings would find little more difficulty in arranging for four days absence than for three, and the advantage reaped would be proportionately greater. Last year the official programme did extend over four days, and we believe that by far the greater number of those who attended the Newcastle meeting remained to the end, and would even have spared a fifth day, could it have been as well bestowed as either of the official four. This is, however, hardly the precedent we care to use. We are most anxious not to appear to take upon ourselves the office of censor or mentor to the Association; but we would certainly, advocate the devoting of an extra day, if it can be arranged to the practical work of reading and discussing the papers presented—though in the hot days of June it may involve some weariness and a little discomfort—rather than to an extension of the festivities of the occasion, however delightful they may be. We do not by any means disparage the importance to the Association of the day usually devoted to an excursion, nor the pleasure and advantage which members derive from the free and cordial intercourse which is then in vogue. We think, however, that it is well, where possible, to combine in that excursion, instruction with enjoyment (a combination usually effected), and we know of no greater danger which could beset the future of the Association than that its holiday aspect, its hospitalities, and mere sociality should assume an excessive importance in the estimation of the members. By all means let every effort be used to make this section of the programme as thoroughly enjoyable as possible, at the same time bearing in mind that it is essentially a secondary and not a principal one.

The British Association of Gas Managers is a society of which its members have reason to be proud, and the growth of which may well cause astonishment to its promoters. It has been productive of much good, and that in several directions, in the past; and its published proceedings are among the most valuable literature at the command of the profession, containing as they do the result of a vast amount of observation, experience, and research. We may well congratulate the Association upon the circumstances under which it now meets; we may also congratulate it upon the career which plainly lies before it of still increasing honour and usefulness.

Gas-works, and the general business of gas making and supply, are usually supposed to present a tolerably promising field for the occurrence of accidents. Gas Companies and their officers are consequently not uninterested in the Bill now being promoted by the Government for defining and increasing the liability of employers to compensate such of their servants as may be injured in the performance of their duties. The Bill, as printed, and read a second time in the House of Commons on Thursday last, has received a remarkably unanimous condemnation from the accredited representatives of the employers in most of the important trades and manufactures of the kingdom. It consists practically of only one clause, and is designed to make the employer responsible, not only for acts done or orders issued by him personally, but by any agent, however far removed, who may hold an insignificant share of deputed authority; the words being, "Any person "in the service of the emyloyer who has superintendence "entrusted to him." Hitherto it has been held, if injury or death has resulted to a workman from the negligence or fault of another workman engaged in the same employ, that the master was not responsible, and this principle of "common employment" has doubtless barred the way otherwise open to many claims of a more or less vexatious character. It is doubtless a terrible hardship upon the widow and children of a man killed by an accident of an easily preventible character that they have not only to deplore the loss of their chief support, but that the law affords them no help or compensation for the great injury. On the other hand, the hardship upon the employer would be even more apparent, if, in such a case, from the neglect or stupidity of one workman, the grave charge and responsibility were put upon his, the employer's, shoulders, of providing for the family of the killed or injured man. In most cases of accidents involving injury or death to the man employed, there is also a destruction of property, which is, in itself, a heavy charge upon the employer. In the course of the debate in the House of Commons, an illustration was used which sets out the case very clearly:—A man is engaged as a bricklayer on a building; he has to work upon a high scaffold, in the erection of which he has had no hand; the scaffold fails to support the weight upon it, falls, and he is killed. As the scaffold was built for him, and he had no choice but to use it, should his family not have a claim upon the employer because of its failure? But the scaffold was correctly designed, the materials were good, and it was put together by men supposed to be specially expert at this particular work. A cord carelessly fastened, a tie left out, and the failure results. The master has no remedy for the injury to his property; is it right that he shall be fined further in the way now suggested? The employers who waited upon Mr. Gladstone to request a reconsideration of the measure appeared not unwilling to accept responsibility for recognized agents or managers, and this, it appears to us, is all that can reasonably be asked of them. At the same time, recognizing, as all classes do, the necessity for some less precarious provision than public charity to meet the cases of those who, to the number of many thousands annually, are exposed to the risk of bitter privation from accidents arising in the performance of duties necessary to the community, some better settlement of the legal position is necessary.

The request of the employers seems to be conceded that the Bill be referred to a Select Committee, which will have power to inquire whether a system of mutual assurance may not be devised to meet the acknowledged difficulty. If such a proposal can be brought into practical form—and there is surely no insuperable difficulty about the task—it will be a most happy issue out of what is at present a perplexing, and threatens to become an angry controversy. Mr. Baxter, speaking for the coalowners, strongly urged this course upon Mr. Gladstone, and undertook that the employers he represented would contribute pound for pound with the men to form such a fund. Mr. John Aird, in a letter which appeared in *The Times* yesterday, suggests that the Government should charge itself with the custody of such fund, and appoint the agents by whom it could be dispensed. Such an arrangement would have this advantage among others, that there would be means sufficient to meet those great calamities which occasionally happen, and overtax the resources of any one local fund. Any such concerted action on the part of masters and men would have the effect of promoting a better feeling between the two classes, while the bringing of actions at law would drive them farther apart, and increase the unfortunate opposition and distrust at present existing. In most gas-works there are sick and accident funds subscribed to by the men, and, in some cases we know of, contributed to by the Directors. Such is the case also in most large works. These form a nucleus which might, we think, be readily developed, and experience proves that a very small sum regularly and universally contributed would suffice to meet, not only claims for accidents, but also the heavier charges due to ordinary sickness and death from natural causes. We believe that the net result from the "voluntary offering" proposed by the employers would exceed that likely to be wrung from them under the provisions of the proposed Bill. The money would, however, be more equitably and uniformly collected, and the participation of the men in the fund would give them an added interest in preventing accidents; further, the latter would be saved from the very possible contingency of a great accident involving a vast number of sufferers whose legal claim, though fully proved, is of no value, because the parties sued, having been themselves ruined by the calamity, have no means to meet the awards. We would urge our subscribers to take such steps as they can to secure that this proposal of mutual assurance shall be fairly considered by the Committee to be appointed.

There is a growing tension, if we may borrow the term from the language of diplomacy, observable in the relations of the Gas Committee and the other members of the Manchester City Council. Frequent squabbles, arising out of this feeling, enliven the meetings of the Council, and there are not wanting other signs to show that a general engagement

is certain in the near future. There is a strong party of the members of the Gas Committee who are dissatisfied with the bondage in which the property for which they are primarily responsible is held by the Improvement Committee, with the sanction of a present majority in the Council. The Improvement Committee, by virtue of the provisions of an antiquated Act of Parliament, claim an annual tribute of ten per cent. on the capital of the gas undertaking, and this heavy charge, increasing, of course, as the scale of operations enlarges from year to year, has been duly paid. But now the Gas Committee find themselves in the exceedingly awkward predicament of having a large amount of capital expended in unproductive works, for which they have to provide the interest, and which the Improvement Committee persist in including with the ordinary capital of the concern, and claim their tithe of the whole. The Gas Committee naturally object to work altogether for the benefit of another department, and, in doing so, to incur the unpopularity of maintaining high prices in order that the spending Committee above mentioned may be kept from direct reliance on the ratepayers for their income. On the other side, it is not to be expected that the Improvement Committee will give way, and submit without a struggle to deprivation of their snug dividend. Consequently, we observe, while the Gas Committee are labouring to put themselves in a position from which they will be able to successfully assault the Improvement Committee, the latter and the friends of the established order of things—including all those members of the Council who cannot see that making gas consumers help to pay rates for non-consumers is a device for raising money by indirect means—lose no opportunity for attempting to bring discredit on the Gas Committee; and this was at least one of the causes of a discussion and division which took place at the meeting of the Council on Wednesday last, when the proceedings of the Gas Committee were brought forward for confirmation. The appointment of Mr. West as Gas Engineer was the ostensible bone of contention, not, we are pleased to observe, from any real dissatisfaction with the selection of the Committee, but on the ground that in some undefined way the prerogatives of the Council had been infringed by the assumption on the part of the Committee of functions respecting the installation of Mr. West, which should have been first submitted to the superior body. This merely technical objection was made a peg whereon a perfectly irrelevant discussion respecting the internal administration of the gas-works at Rochdale Road was hung, and it was not until almost everything which various councillors happened to know about gas manufacture and distribution had been paraded before their impatient brethren that a vote was taken on the ostensible question at issue, resulting in the confirmation of the appointment by thirty-eight votes to six. After this, an attempt to force the attention of the meeting to the distribution of the gas profits was frustrated by a count out, the Gas Committee evidently feeling that the time for the solution of that difficulty had not come, for reasons of which the previous incident afforded indirect illustration.

We need make no excuse for reverting this week to the Leeds Corporation Gas Supply, quoting now from remarks of Mr. A. W. Morant, C.E., made in the course of his address as President of the Association of Municipal and Sanitary Engineers and Surveyors, at the annual conference of that body recently held at Leeds. Since 1876 the price of gas in this favoured town has been lowered from 3s. 9d. to 2s. 2d. per thousand feet, the illuminating power averaging 18¼ candles. An illustration, if such were needed, of the principle that lowering the price tends to increased consumption, is to be found in the fact that the increase recorded for the past year was one hundred million feet—equal to the largest increase in any one year at Manchester, which, considering the difference between the two places, is instructive. What would have been the comparative results if Manchester had followed the example of Leeds, or if Leeds had made a milch cow of the gas undertaking, as Manchester does? There are yet extant heretics who fail to see that market principles apply to gas as to other commodities. It would perhaps be instructive, and certainly entertaining, if we could get one of these financiers to give an opinion on the case of Leeds. We say that the facts are explicable only on the grounds so recently stated by Mr. H. Woodall. If any other reason exists to their discredit, we should be glad to be informed of it.

The affairs of the Rotherham Corporation Gas-Works and the manner in which the profits of that undertaking for the past year have been applied, have excited more than local interest, for mention of them has been made by the London press. It appears that the profit realized on the past twelve months working was exactly £3300, of which no less than £2750 was handed over to the Finance Committee to be applied in aid of the rates. Unanimity respecting this proceeding did not, however, prevail in the Town Council several of the members endeavouring, unsuccessfully as it proved, to secure some consideration for the claims of the gas consumers to a particular share of this respectable surplus. The difference between those who contributed to the gas profit, and those whom its application in the manner agreed on would benefit, was strikingly exemplified in the course of the discussion. It was stated that four of the principal firms of the town were collectively rated at £5200, and by the proposed arrangement would have their rates lightened by about £120 a year; for, making their own gas, they had contributed nothing whatever to the gas revenue. The argument that, as ratepayers, these and similar firms were really responsible for the gas-works, and should therefore participate in benefits derivable from them, may be allowed to pass for what it is worth. We presume that if coal were to rise in price, or for any other reason the expenses of manufacture were to increase, the price of gas would be raised to correspond—the ratepayers would not be called upon for a rate in aid. We wish to commend to all who may be disposed to follow the bad example of Rotherham in this regard, but upon whom the case of these great ratepayers and non-consumers may have some deterrent effect, just one consideration. If all gas profits are applied in the direction of reduction in price, all, or nearly all ratepayers will become gas consumers, and the two interests will become identical; on the other hand, if rates are lightened at the expense of the gas, the heaviest ratepayers (the manufacturers, millowners, and others) will find an increasing advantage in making their own gas, the development of the public gas undertaking will be slow, and the separation of the interests of the ratepayers and gas consumers will be painfully accentuated, with all the attendant evils which unrighteous financing never fails to bring in its train.

A case tried recently before Mr. Paget calls for the serious attention of Gas Companies, or of such a body as the Gas and Water Companies Association representing them. The Wimbledon and Mitcham Gas Company summoned a consumer for the non-payment of his gas-rate. The contention was that the quantity charged was excessive. The Company proved that the meter had been taken down by the official examiner, tested, and found correct. The certificate was handed in, and its validity not disputed. The consumer, on the other hand, stated that while the old meter registered a consumption of 500 feet per night, the new one then in use recorded only 200 feet. On the strength of this statement, the Magistrate expressed himself as having "no doubt" that there was an error in the registration of the meter, and dismissed the summons. If the Wimbledon Company do not appeal against this judgment—and we have not seen an intimation of their intention to do so—a most inconvenient and a very objectionable precedent indeed will have been set up. Such cases, if allowed to pass unchallenged, are acted upon in subsequent disputes, become registered as precedents, and go to make up that great volume of "case law" so frequently consulted. In this instance the facts are all in favour of the Company, and the law clearly requires that the decision shall be according to the facts; but upon the mere statement of the consumer that his consumption has been reduced considerably at a time when he was giving special attention to economy, both law and facts are disregarded, and the rightful claims of the Company disallowed. We repeat that such cases need the attention of Gas Companies generally, and that they should be most jealously watched. Once more we would express the wish that the Gas and Water Companies Association was so generally supported, especially by Gas Companies, as that they might have the right to look to it in such matters. They could not be in better hands.

The sale of gas "to be consumed off the premises," in lighting tramcars, railway carriages, and other moveable structures, is being established as an ordinary branch of the business of the Alliance and Dublin Consumers Gas Company. The Company's energetic Secretary and Manager, Mr. W. F. Cotton, is very sanguine of the ultimate development of this application of ordinary coal gas, from the complete success which has attended his preliminary experiments. Dublin gas with Mr. Sugg's apparatus was tried on one of the Irish railways a short time since, and was entirely successful; but for some reason the Railway Companies did not see their way to its adoption at that time, but preferred a petroleum lamp, which it appears has not met with unqualified approval by the general public. The Gas Company meanwhile were so convinced of the practicability of using gas for such purposes, that they took powers in their last Act of

Parliament for carrying out any systems of portable gas lighting which might prove commercially successful, either with a specially made rich gas, or for the common gas supplied by them in the ordinary course of their business. We hope that the quantity required for this purpose will be such as to repay the Company for their enterprise in taking the matter up so earnestly, and shall await with much interest Mr. Cotton's experiences, which he will doubtless make public on an early date.

Water and Sanitary Notes.

As proposed by the Home Secretary, the House of Commons has agreed to the appointment of a Select Committee to inquire and report as to the expediency of acquiring, on behalf of the inhabitants of London, the undertakings of the existing Water Companies within the metropolitan area, and also to examine and report whether the agreements for the purchase of the Companies, provisionally entered into by the late Government, or any of those agreements, would furnish a satisfactory basis for such an acquisition. The Committee are further to inquire and report as to the nature and extent of the powers of the Water Companies to levy water rates and rents, and how far it may be desirable to modify the same. On the motion for the appointment of this Committee, the House engaged in a prolonged and important discussion: but, owing to the circumstance that the debate took place something like two hours after midnight, the daily papers were utterly unable to do justice to it. By the aid of the telephone, *The Times* succeeded in giving a fuller account than any other paper, but even in that case the report amounted only to the barest possible outline. On reference to another part of our pages, where the debate is given *in extenso*, occupying several columns, it will be seen that it is one which will repay careful perusal on the part of all who take an interest in this subject.

One of the salient points in the debate just referred to was the emphatic manner in which the Home Secretary declared that, unless the reference to the Committee were allowed to stand as he had framed it, he must "wash his hands" of the whole question. "I cannot undertake any responsibility in "the matter of this Committee," said Sir William Harcourt, "unless I am allowed to keep it as an open question whether "the supply of the existing Water Companies is or is not one "that is worth buying." The point thus contended for by Sir W. Harcourt is one to which we have drawn attention before, and is of especial significance. Speaking of the existing works, Sir William told the House, "It may be the "fact that you may buy these things on reasonable terms, "but they may not be worth buying at all." "It may be," continued the Home Secretary, "for this Committee to con- "sider whether the undertakings are worth buying at any "price." Sir William was resolved that this should remain an open question, although it was pointed out that its investigation involved a variety of considerations, calculated to prolong the inquiry far beyond the limits of the present session. The Home Secretary signified that he was doubtful whether or not London should be supplied from the Thames at all. It would be, he said, for the Committee to consider "whether for twenty millions you can have a "better and more abundant supply of water than you can "get for thirty millions from the Companies." Mr. W. H. Smith discreetly observed in reference to the sweeping proposals of the Home Secretary, "You must always bear in "mind that the powers possessed by the Water Companies "have been given to them by Acts of Parliament, and all ex- "perience is against the withdrawal of powers which have "been given by Parliament to public companies." Sir Richard Cross, who made a speech pregnant with information and practical good sense, pointed out that if the Committee were to make an accurate report according to the terms of the reference, there would necessarily be a long and costly inquiry. Mr. Brand and Sir H. Holland feared a similar result. Mr. Ritchie remarked that had the Committee been limited to an investigation of the agreements, their labours might speedily end; but it was now proposed that they should go into "the enormous question" of whether or not it might be better policy to bring in a fresh supply of water altogether. This, Mr. Ritchie predicted, would involve immense labour and serious delay. Nevertheless, despite all argument, the Home Secretary kept to his text, and the resolution was passed in the form for which he stipulated. The responsibility thus incurred cannot be ignored.

There is one serious aspect of the present agitation on the Water Question to which even Sir William Harcourt cannot shut his eyes. A deputation from fourteen Vestries and District Boards, which waited on the Home Secretary last week, said "it is anticipated that a claim for increased rates "under the increased valuation will be made, and it is "desirable that this should, if possible, be prevented." To this proposal Sir W. Harcourt replied by saying that one of the principal subjects to be inquired into by the Select Committee would be the power which the Companies possessed of raising their rates, and the manner in which they exercised those powers. Such an inquiry, he thought, would be more just than attempting to deal with the matter at once. "Par- "liament," said the Home Secretary, "will see that no "crying injustice is done to the inhabitants of the Metro- "polis." "We must see," added Sir William, "if we "cannot accomplish the object of the deputation without "alarming people as to the security of property." A declaration which goes home to the heart of the present controversy was finally made by Sir W. Harcourt, and we trust it will not be lost sight of. Sir William said: "I do not know "anything more unsafe in this country than to make people "suppose the securities given to persons in their properties "by Act of Parliament are not safe, and are liable to be "invaded."

The Times, which recently described the Water-Works Purchase Bill as in a state of "suspended animation," now speaks of it as "dead and buried;" and yet the most important part of the Bill is still alive, for the provisional agreements relative to so many millions of capital cannot be considered a mere spectral illusion. *The Times* echoes the words of the present Home Secretary, that "the Water Companies have "no monopoly in the supply of London." Still "they are "in possession," and this, we suppose, constitutes nine points of the law. They are not to be dispossessed, we presume, without strong and irrefragable reasons Yet it is evident the proposal for a competing supply is virtually an attempt to drive the Companies from that position which the law has given them. The argument held by Sir W. Harcourt, that even "reasonable terms" should be rejected if a new and independent supply offers a temptation to adopt such a course, is one of a most mischievous nature. Probably it would not be politic, but it would be in one sense justifiable, if the Companies were to intimate, in the face of this announcement, that at the close of the present month they will have nothing to do with any more agreements or negotiations, but will fall back solely on arbitration. A different course will probably be the wiser, but some degree of irritation is natural when a Home Secretary counsels the rejection of "reasonable terms," and indulges in lofty talk about a competing supply, or rather a supply which is altogether to supersede that which now exists, supposing such a project to be practicable.

Probably some of the extreme notions of Sir W. Harcourt will be softened down or overborne by the general sense of the Select Committee which is to inquire into the question of the London Water Supply. As proposed by himself, that Committee will consist of Sir W. Harcourt and sixteen other members, among whom are Sir Richard Cross, Mr. Chamberlain, Sir James M'Garel Hogg, Mr. Sclater-Booth, Mr. Brand, and Mr. Parnell. On the whole, it is a powerful Committee. Its nomination was to be moved for last night. The Corporation, we should observe, have also appointed a Committee, with power to take such part as they may think expedient in relation to the forthcoming inquiry in Parliament.

The speech of the Earl of Camperdown in the House of Lords on Friday last was very much in accordance with the demand made by the Vestry delegates, and the answer given by the Earl of Fife was even more explicit than that of Sir W. Harcourt, as to the unwisdom of an arbitrary interference with statutory rights. "Such an interference," said the representative of the Government, "would sap the springs of "commercial enterprise, and would strike a blow at the very "foundations on which repose our commercial undertakings." The unwillingness of the Government to interfere suddenly with the question of annual value is readily to be accounted for, not only on the broad grounds of general policy, but by a shrewd foreboding that this same annual value must be the basis of future charge, whether the water supply be in the hands of the Companies or a Public Authority. A lessened charge may be practicable, but a water-rate, no less than a drainage-rate, must bear some relation to the value of the property which has to bear the charge. As we pointed out some time ago, business premises which consume little water likewise make small use of the drainage works; yet the occupiers have to pay sewer-rates in proportion to their rental. The water supply is not a mere question of individual consump-

tion, but is itself a general sanitary provision, of value to the community at large.

Mr. Thomas Horsey, of Billiter Square, writes to the *Daily News* to complain that he is charged as high as twenty-two shillings per thousand cubic feet for water, and contrasts this with the price of gas. But this gentleman forgets to say that he might consume a much larger quantity of water without paying any more for it, whereas any increase in his consumption of gas is accompanied by an increased demand on his pocket by the Gas Company. Mr. Horsey also fails to perceive that in all probability he will have to pay for his water on the basis of his rental, even when the Companies are superseded by the coming "Authority."

RIVER WATER.

Born in spirit and substance, in argument and fact, Dr. Meymott Tidy's recent lecture, delivered before the Chemical Society, on the subject of "River Water," is an admirable answer to those far-stretched objections against the Metropolitan Water Supply which have done much to disturb the public mind. Dr. Tidy's paper, or lecture, has a wider scope than the Water Supply of the Metropolis, but nowhere else does it meet with so important an application. Concerning the tenor of his remarks, good sense and scientific acumen characterize all that Dr. Tidy has advanced, and, as a foundation for his assertions and contentions, there is a solid substratum of fact and experiment. The paper is long, but none too long for the matter it contains. In an early part of his address, referring to different methods of water analysis, Dr. Tidy speaks of the value both of the oxygen process and the combustion process, but expresses regret "that conclusions of "grave importance sanitarily, and involving serious interests "monetarily, should ever be based on determinations of the "so-called albuminoid ammonia, which determinations are as "incapable of arrangement or of interpretation as they are "outside the sphere of scientific accuracy."

Dr. Tidy's researches include the water of the Thames, the Lea, the Severn, the Shannon, the Egyptian Nile, and incidentally some other rivers. He properly observes that the use of the term "total solid impurity" to signify the "total "solid matter" in water is scarcely expressive of the facts, and, although chemically accurate, may lead to some misapprehension. In a chemical sense, we presume nothing short of distilled water can be considered pure. Yet the public would never tolerate distilled water as a beverage. The facts observable in the case of the Nile are specially interesting as showing in the highest degree the extent to which the quality of river water is affected by the action of floods. The Severn affords a singular instance of having a varying proportion of chlorine as exhibited by samples taken at the same time only a quarter of a mile apart. The chlorine in one sample will sometimes be double that in the other, although there may be no possible source of sewage contamination whereby to account for the difference. Professor Ansted—whose decease we now deplore, and who was associated with Dr. Tidy in one of the inspections which yielded these strange results—considered that the existence of bottom springs, rising through new red sandstone (itself a salt-bearing stratum) is the explanation of this unusual occurrence. Professor Ansted informed Dr. Tidy that salt springs are known to rise in the bed of the Trent, and affect the quality of the river water in a very sensible degree. The possibility of such a disturbing cause being in operation is assuredly not to be lost sight of in river investigations.

Floods necessarily affect the purity of rivers. The first result of a flood is to raise the impurity of the stream to its maximum; but this is followed by a condition of things which brings the river to a state of maximum purity. The turbidity, in the first instance, is occasioned by the washing of the drainage area, and this area being thus made clean, the water becomes the better for it. Certain other deductions are worked out from a careful observation of floods, and one general conclusion from the facts is this—that "if river water "be used as a supply, a river subject to frequent floods is not "necessarily a disadvantage." In advising as to what water should be taken into the reservoir, and what rejected, in order to avoid the bad and not lose the good, the chemist can immensely assist the engineer. The average period of primary flood water should be accurately studied, and the general law should be borne in mind, that the last day of low water is worse than the first, and the first day of high water worse than the last. The use of primary flood water should be avoided as far as possible, and on this account due provision must be made in the shape of storeage reservoirs. The difference between the primary flood water and the secondary, in reference to the amount of solid matter and organic impurity, is very marked. It is also observed that in summer the longer the interval between two floods the better the water is, so far as organic purity is concerned; but in winter the longer the interval the worse the water is when the flood comes.

In treating of peat waters, Dr. Tidy mentions a very striking illustration which came under his own notice, as to the oxidation which goes on in running water freely exposed to the air. At a Water Company's works in the North of England, where the supply is of a peaty character, a large distributory reservoir near the town is filled from a storeage reservoir 6820 yards distant. The water is delivered into the distributory reservoir by two channels, one being a closed iron pipe and the other an open brick conduit, the fall between the two reservoirs being 401 feet. Both channels leave the upper reservoir by the same pipe, the pipe dividing soon after leaving the reservoir. When the lower reservoir is reached, the water taken from the closed pipe exhibits a well-marked peaty tint, but water taken from the open conduit is nearly colourless. On analysis, the water from the upper reservoir gave 0·461 part of organic carbon per 100,000, and the water at the lower end of the closed pipe gave practically the same result. But the water from the open conduit contained only 0·23 part of organic carbon per 100,000. Thus there was apparently complete proof of the oxidation of peat. The result appears the more important when we consider that the oxidation of vegetable matter is, as Dr. Tidy shows, incomparably less rapid than the oxidation of animal matter. We should observe that Dr. Tidy is careful to show the distinction between the mere bleaching of peat and its actual oxidation, by which he means its entire destruction, or burning up. A colourless water may still contain a considerable quantity of dissolved peat.

A curious phenomenon with regard to peaty rivers is that they are capable of being benefited by the introduction of water rendered turbid by mineral matter. Dr. Tidy was consulted by the Limerick Water Company as to whether they should remove their intake on the Shannon to a point above that where the River Mulcaire enters the main stream. The water of the Mulcaire, although otherwise good, is singularly turbid, owing to the presence of red sandstone drift mixed with more or less road mud. At first, having apparently in mind the case of the River Mole, on the Thames, Dr. Tidy was inclined to recommend the removal of the intake. But on making a close investigation of the circumstances, he found that where the muddy Mulcaire joined the Shannon, the admixture of the apparently impure water was the means of effecting purity, the mineral matter causing the deposition of the peat, both going down together. Neither was it a mere ocular phenomenon. A quarter of a mile below the junction of the Mulcaire the organic carbon fell from 0·914 to 0·61 part per 100,000, and the oxygen required from 0·37 to 0·27 grain per gallon. Some laboratory experiments further proved beyond question that a turbid feeder may be an advantage to a river, and serve as a means of purification. Accordingly, Dr. Tidy advised the Limerick Company not to move their intake.

The pollution of river water by sewage comes "last but not "least." Dr. Tidy agrees with Dr. Frankland in considering this "a subject of vital importance." Dr. Tidy does not seek to evade the issue by drawing a distinction between healthy and unhealthy sewage. He regards all sewage—and contends that it should be so regarded—as unhealthy, and absolutely objectionable when existing in water used for drinking purposes. But Dr. Tidy contends that "if sewage be discharged "into running water, the organic impurities will, after a flow "of a few miles, be entirely destroyed or got rid of, the water "once again assuming its normal condition of purity." This power of self-purification is said to depend on three things—namely, on the subsidence of the suspended impurities brought down by the sewage; on the presence of animal life in the river; and, lastly, on the oxidation of the organic matter. The question is asked: Are we never to drink water which has once been contaminated with sewage? In reply, it is said that we might as well object to breathe an air which has once been polluted by the scales of a person suffering from scarlet fever, or the infected breath of one attacked by measles. If oxidation purifies in the one case, may not the same power be expected *à fortiori* to act in the other? "dis-"solved oxygen," to quote Dr. Frankland's own words, "being well known to be chemically much more active than "the gaseous oxygen of the air."

Three kinds of evidence are adduced in proof of the oxidation of sewage in running water. There is, first, the evidence

obtained by the unassisted eye. The sewage at an outfall is probably offensive, very turbid, and more or less brown. Tracing the sewage stream down the river, it will be seen to assume a black appearance, from the formation of sulphide of iron. A little farther on the blackness perceptibly decreases, and continues to do so almost yard by yard, until at last the river water exhibits no signs of colour, turbidity, or smell. Another test is that afforded by the sewage fungus, the presence of which is almost an absolute indication that sewage in considerable proportion is mingled with the water. Where this is the case, all signs of vegetable life, except perhaps a few straggling weeds, disappear; and no fish, or only fish of a certain kind, are to be seen. The banks and river-bed become black, and branches of any trees that by chance dip into the water will be seen covered with a black flocculent deposit. But a short distance below the outfall the sewage fungus cannot be found, vegetation becomes clean and luxuriant, fish are abundant, and the banks and river-bed, seen through the now clear water, show no signs whatever of that black deposit observed higher up the stream. In proof that these are no fancy sketches, Dr. Tidy states that he has seen the River Soar at Leicester black with sewage, no river vegetation being visible. The day following he has seen the river at Loughborough, thirteen miles below Leicester, perfectly clear, the banks clean, and fish abundant. At Manchester he has seen the Irwell polluted with every form of filth, personal and manufacturing; whereas at Warrington, after a flow of nine miles, the stream was perfectly free from everything offensive. Other instances are given, and Dr. Tidy says he could cite still more. He contends that the change which is thus apparent, whereby a foul, offensive river becomes to all appearances pure and fresh, must be due to some power of self-purification.

The next step conducts us to a more refined test—namely, that of analysis. As far down as Lechlade the water of the Thames is as nearly as possible of a normal character, practically no sewage having found its way into the river. Between Lechlade and Hampton (speaking of the state of affairs a few years ago) the river received the sewage of nearly a million people. One mile below Reading, Dr. Tidy has found the proportion of organic matter in the river to be at least double that indicated at Lechlade. But four miles farther on the water was again found to have become normal; while the organic carbon and nitrogen at Hampton, notwithstanding the sewage of the foregoing million of people, was rather less than at Lechlade. The question follows—What has become of the sewage of this million of people, if it has not been oxidized during the flow of the river? Near the spot where the sewage of Worcester is discharged into the Severn, the organic carbon is 0·842 part per 100,000. A mile below the sewer outfall the proportion is 0·510. Two miles and a quarter below Worcester (the River Teme having meanwhile joined the main stream) the proportion of organic carbon is only 0·101. From Bishop Auckland to Durham, the River Wear receives the sewage of about 100,000 people, including that of the former place. The rocky bottom of this river constitutes a series of natural weirs, and the mechanical action on the water is so great that at Durham, a distance of only thirteen miles from Bishop Auckland, the river shows a far greater degree of purity than it does above the sewer outfall at Bishop Auckland. It is singular that Dr. Tidy is able to quote the Sixth Report of the Rivers Pollution Commissioners in support of his argument. So satisfactory is the analysis of the water of the River Wear at Durham, that although it contains the sewage of 100,000 people, and the Commissioners feel bound to make some protest against the use of a sewage-contaminated river as the source of a drinking supply, yet the report describes the liquid as "a good water." The analyses of the water of the Wear are remarkable as showing not only that the organic matter becomes oxidized, but that the water at Durham is absolutely free from nitrates. No doubt they are formed, says Dr. Tidy, but they do not reach Durham. The excess of chlorine also disappears, being probably taken up by vegetation.

Having proceeded thus far with Dr. Tidy's paper, we shall complete our notice of it next week, at the same time adverting to the discussion which ultimately took place in reference to a portion of its contents. Necessarily Dr. Frankland objected to much which had been advanced by Dr. Tidy, though on some points he expressed a cordial agreement. Dr. Frankland also brought to his help a letter which he had received from Professor Tyndall, opposing the views of Dr. Tidy on the existence of germs. Professor Huxley likewise did battle for the bacteria, and contended that chemical analysis might declare a water to be pure which was as deadly as prussic acid.

Communicated Article.

THE ACTION OF THE BLOWPIPE CONSIDERED WITH REFERENCE TO THE PRINCIPLES OF GAS ILLUMINATION.

By Mr. R. H. Patterson, F.S.S.

Conclusion.

One thing certain is that a mixture of air with coal gas before ignition greatly reduces, and if increased wholly destroys the illuminating power of gas-flames. The effects of this commingling of air with gas are stated thus:—

Per Cent. of Air.	Loss of Light.	Per Cent. of Air.	Loss of Light.
1	6	8	58
2	11	9	64
3	18	10	67
4	26	15	80
5	33	20	93
6	44	30	98
7	53	40	(no light) 100

I may remark that when only a small quantity of air—say 1 per cent.—is mixed with the gas, the effect upon the illuminating power of the flame would vary very much according to the kind of burner employed. The combustion is produced by means of the external atmosphere, *plus* the air contained in the gas; so that the effect of the mixture of air will be increased or diminished according to the great or less external air supply, or draught, upon the flame. Accordingly, in the supposable case of the external air supply being deficient, a small admixture of air in the gas would actually increase the illuminating power. On the other hand, when an Argand of the old kind is employed—viz., one from which the gas (owing to the smallness of the orifices and other causes) issues under considerable pressure, thereby producing a greater draught upon the flame—the mixture of air will cause a greater loss of light than if the gas were consumed in one of the new and pressureless burners. Nevertheless, when the mixture of air rises beyond 2 or 3 per cent., the kind of burner will cease to make any perceptible difference. So that so far as the burner affects the question, it may be safely assumed that, as shown in the above figures, when the admixture of air amounts to 50 per cent. (*i.e.*, when the mixture is half air and half gas) the illuminating power becomes wholly destroyed.

Still, it seems strange that 10 per cent. of air should reduce the light by 67 per cent., while another 10 per cent. only reduces it 26 per cent. more; while a third 10 per cent. should only reduce the light 5 per cent., and a fourth 10 per cent. (viz., when the air is increased from 30 to 40 per cent.) only impairs the light to the extent of 2 per cent. These are curious facts, if correct, and I do not know upon whose authority the above table rests; it is quoted by Dr. Letheby, but he does not say that he made the experiments and ascertained the facts for himself. I should be much inclined to question the accuracy of the table; but it is all we have to go by at present; and although the *gradation* of the figures may suggest a doubt, the ultimate result, that light is destroyed when the gas contains 40 per cent. of air, does not appear at all improbable, and is always accepted as an ascertained fact.

Another fact of much significance in this inquiry is the effect of a gradually increased supply of air to an Argand by means of a quickened draught upon the flame. The flame becomes smaller, but more brilliant. In a series of experiments of this kind which I made in 1870, while noting the changes both in the height and illuminating power, I also observed the changes in the *intensity* of the flame, by placing in front of the flame a metal plate with a horizontal aperture about half an inch in depth, which was raised or lowered in each experiment so as always to be on a level with the brightest part of the flame, the rest of the flame being hidden by the metal plate. The following were the results obtained, the highest illuminating power of the entire flame, and likewise of the narrow band of flame, being each taken as 100:—

Sugg's "London" Argand, No. 1, consuming 5 Feet per Hour of 16-Candle Gas.

Experiments.	Size of Chimney.	Height of Flame.	Illuminating Power of the Entire Flame.	Varying Intensity of the Narrow Band of Flame.
No. 1.	Without chimney.	8 inches.	66·0	29·3
„ 2.	6 in. × 1¾ in.	Smoked.	98·0	82·0
„ 3.	6 in. × 2 in.	Smoked slightly.	98·2	82·6
„ 4.	6½ in. × 2 in.	4·0 inches.	98·7	83·7
„ 5.	7 in. × 2 in.	3·6 „	100·0	90·0
„ 6.	7½ in. × 2 in.	3·25 „	99·2	92·9
„ 7.	8 in. × 2 in.	3·0 „	96·7	94·7
„ 8.	9 in. × 2 in.	2·75 „	92·1	97·1
„ 9.	10 in. × 2 in.	2·6 „	87·9	98·9
„ 10.	11 in. × 2 in.	2·5 „	84·57	100·0

A mere reduction in the size of the flame, although in the above instance it amounts to nearly one-half, does not necessarily involve a diminution of light; because the same quantity of illuminating substance is consumed, and, as is shown in the electric light, even a light which in size is little more than a speck or spark may give a vast amount of illuminating power. Also, as above shown, the gas-flame constantly increased in brightness or intensity as its size was reduced. The question is, Why should the increased intensity of the gas-flame, beyond a certain point, fail to compensate for its reduction in size or volume?

In connection with this question, I may mention an opinion strongly held by Mr. Sugg, and which is more or less in accord with

some of the chemical phenomena of a gas-flame already stated. Mr. Sugg holds that the great advantage of gas being consumed without pressure is, that, when so consumed, only the oxygen of the air really impinges upon, and combines with the surface of the burning gas. We have seen that the heat of the flame produces "dissociation" *within the flame* (among the constituents of the gas itself); and Mr. Sugg believes that the heat of the burning gas likewise produces dissociation in the immediately surrounding portion of the air; the oxygen being disunited from the nitrogen, and being drawn in by itself to feed the flame. So far as there is a difference between this and the common opinion, it amounts to this—that the nitrogen does not really touch (and cool) the surface of the flame, but that the flame, if perfectly consumed for illuminating purposes, simply attracts and draws in upon itself the oxygen from the atmosphere. On the other hand, if the gas be consumed under pressure, there is not room for this dissociation to take place; the air is too short a time in proximity to the flame to become heated up to the point where the oxygen becomes dissociated from the nitrogen; the air as a whole, or in its ordinary state, being driven in upon the flame, whereby the surface of the burning gas is somewhat cooled by contact with the incombustible nitrogen; or, which comes to the same thing, the flame does not rise to the high temperature which it acquires when it is able (as it were) to select the oxygen from the atmosphere. Now, it is possible—I do not say more—that this fact (?) may explain how it is that beyond a certain point the quickening of the draught upon the Argand flame produces a diminution of light. More oxygen is driven in upon the flame, but it is accompanied, more or less, by the nitrogen; and in proportion as the process of dissociation in the feeding air ceases, the greater is the drawback which ensues upon the increased supply of oxygen.

Looking at the facts just passed in review—viz., the experiments with the Argand, compared with the effects of a mixture of air with the gas as manifested in the flame of the Bunsen burner and the blowpipe—it is manifest that there is a vast difference between quickening (however greatly) the draught upon a flame and mixing air with it. In the Bunsen burner and the blowpipe, where air is intermixed with the gas or its flame, the illuminating power becomes destroyed; whereas, so long as the air plays only upon the surface, the flame, although diminishing in size, increases in brilliancy.

The two explanations of the action of air in reducing or destroying the illuminating power of gas are entirely conflicting. One of these, and the received opinion, is that the carbon particles of the gas are too quickly consumed to allow of their emitting or developing light; the other opinion, partially held, is that the air impairs or destroys the luminosity of the gas by cooling the flame. Now, as quickened consumption of the gas implies a higher temperature of combustion, it is obvious that, in the first of the two explanations, the luminosity is destroyed by the gas being burnt at too high a temperature; while, by the second explanation, the light is destroyed by the gas being burnt at too low a temperature. Which of these explanations is the right one? or perhaps we should say, *how far* is either of them right?

The second is the more readily intelligible. Every one will acknowledge that cooling a flame reduces its luminosity; and the sole object of heating the air and gas is to raise the temperature of combustion, and thereby obtain more light. On the other hand, the former and received explanation more fully accounts for the very various phenomena.

In favour of the cooling hypothesis, it is certain that when the air supply increases to a certain (or, rather, very uncertain) degree, a flame is extinguished altogether. It is blown out. The mass of air thrown upon the flame entirely destroys combustion. And in this case there cannot be a doubt that the flame is extinguished by being cooled. Again, a sudden draught or gust of wind (as Dr. Letheby once pointed out) will make a flame smoke. In this case the air is not enough to extinguish the flame, but it so cools it as to leave part of the carbon unconsumed. These are indubitable proofs of the cooling action of air upon flames, in reducing their illuminating power.

Next, as to *doubtful* proofs of the same thing. As shown in the Argand experiments, when the draught increases beyond a certain degree, the illuminating power is somewhat impaired; and also when air is mingled with the gas before ignition, the decrease of luminosity is very marked; but whether are these effects produced by cooling the gas, or by "over-combustion," which means an increased temperature of combustion? We can readily understand the first hypothesis, but the second conflicts with the well-known and universally received maxim that the higher the temperature of an illuminating substance, the greater its luminosity. Hence, if ready inference were to settle the question, one would say that in all these cases (as indubitably in the two first mentioned) the decrease or destruction of light was owing to the "excess" of air *cooling* the flame.

But how can we believe that the gas-flame is cooled by an intermixture of air, if the Bunsen burner and the blowpipe give hotter flames than the ordinary ones? As already stated, my experiments (not decisive) indicated that the Bunsen flame is not so hot as that of an ordinary gas-burner; as I have also shown that, despite its greater results (owing to a more powerful *application* of the heat), it is not *certain* that the blowpipe has any superiority in heat of flame or temperature of combustion.

It is certain that air may be thrown on a flame in such quantity as to extinguish it; and that this is owing to the large proportion of incombustible nitrogen contained in the air. But is it not conceivable (and theoretically certain) that even an excess of oxygen would do the same; for every particle of it which is in excess—*i.e.*, which cannot combine with the combustible gas—is just as incombustible as nitrogen itself.

There must be a certain quantity of air supply which is best for developing the illuminating power of gas; and too much or too little must be adverse to the illuminating power. Everybody knows this. And also every one knows how *too little* air impairs the light, whether by the total combustion being sluggish, at a low temperature, or by part of the gas not being consumed. But how does the *excess* of air operate? In great quantity, I repeat, air wholly extinguishes a flame, by cooling it; but, short of this quantity, is there an excess of air which actually raises the temperature of the flame, yet destroys its illuminating power? This is what the received opinion maintains. Is it correct?

Manifestly, I think, the effects upon the illuminating power of mixing air with the gas *before ignition* (as shown in the experiments quoted from Dr. Letheby); of mixing the air with the gas *partially* before igniting, as in the Bunsen burner; and of mixing the air with the burning gas (or with the gas-flame), as in the blowpipe, are ascribable to the same cause, whatever it be. The effects of quickening the draught or air supply upon the *surface* of a gas-flame (as shown in the experiments with the Argand) *may* belong to a different cause; nevertheless, it is probable that they are produced by the same cause, but operating in a gentler fashion. Therefore we come to the ultimate question—Is the decrease and eventual destruction of the illuminating power of gas exhibited in the Bunsen burner and the blowpipe, occasioned by the excessively quickened combustion of the gas, at an increased temperature (called "over-combustion"), which is the received doctrine; and, if so, how are we to explain this phenomenon in the face of another received opinion, that the higher the temperature of combustion the higher the illuminating power? Or is it a mistake that the Bunsen burner and the blowpipe consume the gas at a higher temperature; and are the whole phenomena of loss of light from an excessive air supply due to the *cooling* of the flame?

P.S.—It seems impossible to ascertain the temperature of combustion of the gas-flame from a blowpipe in a manner applicable to the present question—namely, to determine the absolute temperature at which the gas burns, irrespective of the high *applied* heat produced by a concentration of the flame. But it is an easier matter to test the heat of a Bunsen flame compared with that of an ordinary burner; and if, despite the somewhat smaller volume in which the gas burns in the Bunsen apparatus, the ordinary gas-flame shows the higher temperature (as appeared in my confessedly inadequate experiments), then the general belief as to the superior temperature of the Bunsen burner must be abandoned. Will some of your readers make such experiments for themselves, and thereby take one step towards finding a conclusion to the case, the very various parts of which I have now set forth?

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

MR. NIVEN'S PAPER ON CORRECTIONS FOR TEMPERATURE AND PRESSURE.

SIR,—In the last number of the JOURNAL a report is given of Mr. D. C. Niven's paper, with a rather lengthy title, on the methods of correcting gaseous volumes for temperature and pressure. Some of the expressions in that paper are so strange (and I say this without the slightest intention to be offensive), that, if the author's name had not been given, I should be fairly puzzled to determine whether the paper was the production of a person who was fully instructed on the subject, or of some one who had just applied himself to its study. I am convinced, however, that Mr. Niven understands the subject well; but his enthusiasm in the cause of "simplification" has led him to attach an undue importance to differences which are of little moment in a practical point of view.

Mr. Niven says: "The factor 480 can now hold no place in the volume and temperature of gas;" by which expression he means, I presume, that the factor 480 as a coefficient of expansion can now hold no place in any formula for correcting the volume of gas for temperature.

Perfectly correct; but when Mr. Wright calculated his tables of volumes, 480, as determined by Gay Lussac, was the accepted coefficient, and continued to be accepted until Regnault finally fixed it at 491-2 Fahr., or, as he gave it, ·0036666 C. That differences in the tabular numbers, as given by different authorities, should exist, ought to be no cause for surprise to a mathematician; the coefficient of expansion of air and gases lying between 491 and 492, some persons will elect the one and some the other, this making a difference, although a small one. Again, the tables are limited to four figures, and this limitation involves errors, some of the numbers being a little too small, and others a little too large—which numbers may be in excess and which in deficit depending to a certain extent upon the election of the calculator. Thus, taking the first page of Table C in the Appendix to the "Gas Analyst's Manual," and following the first line vertically, it will be found that the progression in difference is by 4 and 3—thus, 4, 4, 3, 3, 4, 4, 3, 4, 4, 3, 4, 3; while horizontally it is 5, 5, 4, 5, 5, 4, and so on. If the figures be traced angularly from 998 on the top of the first column to 981 in the right-hand column, the progression is 1, 1, 1, 2, 1, 1, 1, 2, 1, 1, 2, 2, 1. Even if the numbers were extended to seven or eight figures, similar but smaller differences would still arise. The table just mentioned only contains a few figures of my own, it being otherwise a copy of that issued by the Metropolitan Gas Referees, and the figures differ from the older tables because, first, aqueous tension is taken into account, and the coefficient 492 is taken for temperature. Taking extremes, 28 inches and 31 inches Bar., and 32° and 84° Ther., the numbers in Mr. Wright's table are 988 and 987; while in the new table they are 998 and 967, showing in each case a difference of a little over 1 per cent., but in contrary directions. As, however, the difference would only operate one and not both ways at a time, we see that, in

correcting for volume, where illuminating power is concerned, the new table should, at 32° Fahr. and 28 inches Bar., show the gas to be 1 per cent. *less* in power than the old table, and at 84° Fahr. and 31 inches Bar. 1 per cent. *greater*. Thus:

Illuminating power		17·5
Multiply by		1000
Table No., old table, 32° and 28 in.	988)	17500
Result		17·71
As before		17·5
		1000
Table No., new table, 32° and 28 in.	998)	17500
Result		17·53

The difference in candles is 0·18—surely no great and serious matter.

Mr. Niven says the rule given for the correction of volumes of gas to true bulk (*i.e.*, bulk which such volume would occupy at 60° Fahr. and 30 inches Bar.) "seems to convey the idea that the table can be used for corrections for temperature and pressure." I am very glad that the words do so seem to convey such an idea, for they were absolutely intended to do so; "and yet, if that be so, there are at least apparent mistakes." In what? If in the numbers, the cause has already been explained, and the little importance of such differences indicated. The table shows us to what extent 1000 volumes at various pressures and temperatures would be in excess or deficit, if subject to what is still called standard temperature and pressure. Hence the performance of the operation indicated by the rule gives the true bulk, not only as nearly as any practical man can require, but sufficiently so in most cases for the wants of the scientist.

Mr. Niven has been good enough to say that I am in general a clear writer; I can only hope that what I have now written will be sufficiently clear to show him that it is scarcely worth while to strain at the gnats of small errors while the camels of graver ones remain to be swallowed. I admire the ingenuity of Mr. Niven's formula, but am afraid I am now a little too fixed in the old mode to take kindly to the new.

55, *Millbank Street, London, June* 2, 1880. F. W. HARTLEY.

THE USE OF GASEOUS FUEL.

SIR,—In reference to your remarks in the "Circular" of the 25th ult., concerning the duty of gas fuel in water heating, as given in my lecture before the Society of Arts, I may state that the results were obtained, not with a test meter, but with a jet which had been tested at the Warrington Gas-Works, and verified afterwards at the Birmingham Gas-Works. Both experimenters said that the jet passed, at 10-10ths pressure, 24 cubic feet of gas per hour. The apparatus I used for the experiment has been sold, and therefore I cannot repeat it under precisely the same conditions. The gas was burned perfectly in one solid flame, with precisely the right proportion of air for complete combustion, and the products of combustion were cooled down by the feed water, leaving the apparatus at a temperature not exceeding 70° Fahr.

To prove that there was no glaring error such as you imagine, I have repeated the experiment with one of my ordinary pattern water heaters, having fifty coils of very thin copper tube. In this there is a decided loss of heat by radiation from the outer casing, and the products of combustion leave the apparatus at 115° Fahr. In this I find that the available duty, working with a tested jet passing, at 10-10ths pressure, 20 cubic feet of gas per hour, is equivalent to 6¾ pints or 135 fluid ounces of water heated from 52° to 212° Fahr. with 1½ cubic feet of gas. The difference between this result, which I have obtained three times on three different days, can, I think, be fully accounted for by the comparative imperfection of the apparatus used in the last experiment.

I have no test meter to absolutely verify the results, but I have a complete set of jets tested under different pressures by Mr. James Paterson, of the Warrington Gas-Works, and verified by Mr. Wood, of the Birmingham Gas-Works, and these jets (not copies of them) were used in my experiments. As I worked without a meter, I was careful to state that it required about 1½ cubic feet of gas to boil one gallon of water, leaving by my wording a margin for possible errors which I could not check with my own apparatus.

I enclose a copy of the jet which was given to me as passing, at 10-10ths pressure, 20 cubic feet of gas per hour. With this jet and gas at the specified pressure I heat 6 pints of water in 1 minute from 52° to 92° Fahr., which is equivalent to 1½ pints to 212° Fahr. As the burner requires at 20 cubic feet per hour 4½ minutes to pass 1½ cubic feet of gas, it would appear that either your remarks are slightly incorrect, or the jet has been twice tested by good authorities with the result of a blunder exactly corresponding in both cases. That the latter is not the case I am certain, as, since writing the above, I have tested the jet I now send with the drum of my ordinary meter, and it is, if not absolutely correct, so near that I cannot detect any error. The gas used was the ordinary "stock pattern, warranted always good alike," as supplied by the Warrington Gas-Works, and the odd 1½ cubic feet used for my first experiment were *not* manufactured specially for the occasion. If it was wonderful, it is a daily and nightly wonder all the year round. It is evident there is something wrong somewhere, as the available duty, even in a very imperfect apparatus, is greater than that stated as the maximum theoretical duty possible. I have been informed that the available duty, as obtained in the injector furnace, is also greater than the maximum theoretical duty of the fuel used, this information coming from a well-known chemist as the result of his own work and experiments with the furnace, and not from my statements or results.

Warrington, June 2, 1880. THOMAS FLETCHER.

[The basis upon which the comments referred to by Mr. Fletcher were made, is an analysis of common coal gas made by Dr. Letheby, and quoted by Dr. Wallace in our issue of Dec. 9, 1879, p. 902. In this the calculated thermal power of 1 foot of 12-candle gas is stated as 621 units. We allowed for slightly better gas in giving 1050 units as the heating power of 1½ cubic feet. A gallon of water weighs 10 lbs., and there are 162 degrees between 50° and 212°, hence 1620 units of heat are required to raise it through this range of temperature when 1050 only are available. If Mr. Fletcher is right, it follows that Dr. Letheby is wrong; but the onus of proof certainly lies with the former gentleman. We do not pretend to say where the mistake has been made, but that there is a discrepancy Mr. Fletcher admits.—ED. J. G. L.]

PUMPING GAS AT BECKTON AND LIVERPOOL.

SIR,—In this week's JOURNAL the pumping machinery as made by Messrs. Gwynne and Co. for Liverpool is illustrated, and for some weeks past you have kept us amused in your correspondence columns by the claims of that firm to be the *first* to make such an arrangement, which they state they patented in December, 1871.

I think Mr. Trewby is quite right in saying they merely added to Her Majesty's Exchequer by so doing, for in the summer of 1870 I erected at the Great Brunswick Street works of the Dublin Consumers Gas Company two larger exhausters, coupled direct to the shaft, one on each side of a 16-horse power horizonal high-pressure engine, the slides of exhausters set at right angles to reduce oscillation, and of which your illustration this week is a copy.

I have no doubt the members of the British Association of Gas Managers will remember seeing them in action, on their visit to Dublin in June, 1871, and as I did not patent it, any engineer was at liberty to adopt the same arrangement.

It is an example of the old proverb that "necessity is the mother of invention," for there was not room in the engine-house to put down two separate engines and exhausters, so I designed that arrangement for the sake of economy in space and money. The engine was made by Messrs. J. and J. Ellis, of Salford, and the whole apparatus worked admirably.

I had no intention of intruding myself upon your notice, but when Messrs. Gwynne and Co. so repeatedly and boastfully lay claim to *their being the first to see the necessity for such an arrangement*, I think they had better be reminded that they were not *the first* to erect and use what, after all, is but a trifling matter, and which any engineer would do under similar circumstances. JOHN SOMERVILLE.

South Metropolitan Gas Company,
589, *Old Kent Road, S.E., June* 5, 1880.

EMPLOYERS LIABILITY BILL.

SIR,—There are three Bills under the above title now pending in Parliament—one in the House of Lords, and two in the House of Commons. Of those in the Commons, one is promoted by Her Majesty's Government, and the other by the members who are supposed to represent the interests of the working classes. The main object of all three Bills is the same, although they differ in the mode of carrying it out. As, however, the Government Bill is the only one likely to be proceeded with, it is unnecessary to do more now than state what the provisions of this Bill are, and these may briefly be described as follows:—

"The workman, his wife, children, or legal representatives, shall have the same right of compensation and remedies against the employer as if he had not been a workman of, or in the service of the employer, nor engaged in his work: Provided always that the workman injured did not materially contribute by his own negligence to the cause of his injury."

In the early part of last week this Bill was placed on the list for second reading on Thursday, the 3rd inst. As this was rather sharp practice, the railway companies, coal and iron masters, dock companies, and others, asked the Prime Minister to receive a deputation from them before the second reading, and he appointed Wednesday, the 2nd inst., for the purpose. Thereupon a general meeting of all parties interested was convened for the Tuesday preceding, to consider and determine what course should be pursued at the interview with the Prime Minister; and all large employers of working men—gas companies among the others—were invited to send representatives to the meeting, and the gas companies did so. The meeting was well attended, and after some discussion it was resolved unanimously to urge the Prime Minister to refer the Bill to a Select Committee, to consider the expediency of establishing a mutual insurance between employers and employed, each paying equal contributions, instead of the provisions then in the Bill.

The Committee of the Gas and Water Companies Association then held a meeting to consider this proposal, but with only the information then before them they did not feel authorized in saying that the Association would either accept or reject it, and therefore decided to accompany the deputation, but not make any special reference to the gas companies case.

At the interview with the Prime Minister all the persons who addressed him strongly recommended the adoption of the course proposed in the resolution passed at the preliminary meeting. In reply, he thanked the deputation for having so clearly expounded their views, and said that they should receive his careful consideration, but that he could not at that time pledge himself to any particular course, or say whether Her Majesty's Government would or would not consent to the Bill being referred to a Select Committee. Since then the Bill has been read a second time, and passed through a Committee of the whole House (*pro formâ*), with alterations. It is, therefore, now in the hands of the Government, to be altered as they think fit. When they have decided in what shape they will proceed with it, it will be reprinted and brought forward again, and then if the opponents are dissatisfied, they can move that it be referred to a Select Committee; but at present the Government decline to say whether they will adopt that course or not.

Much might be said against the Bill, both as to the principle and detail; but as it may, and doubtless will be very considerably altered when brought forward again, it would be but a waste of time to go into the objections now. When the Bill is reprinted a copy will be sent to all the members of the Association, and the Committee will hold a meeting to consider what course it may be desirable to recommend the companies to adopt. W. LIVESEY.

Gas and Water Companies Association, 6, Victoria Street, Westminster Abbey, S.W., June 7, 1880.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, Etc.

SESSION 1880.

PROGRESS MADE TO SATURDAY, JUNE 5.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Ackworth, Featherstone, Purston, and Sharlston Gas Bill	Lords	..	..	..	..	..	..
Birkenhead Borough Bill	Commons	Feb. 9	Feb. 10	March 8	..	..	..
" " "	Lords	Bill with-	drawn.				
" " "	Commons						
British Gaslight Company, Limited (Staffordshire Potteries), Bill	Lords	Feb. 10	Feb. 10	Feb. 23	..	..	..
	Commons	..	..	..	..	..	..
Burton-upon-Trent Corporation Bill	Lords	Comns. Bill	May 27	June 4	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 16	March 11	May 25	..
Cardiff Water Bill " "	Lords	Feb. 10	Feb. 10	Feb. 20	March 8	March 11	..
" "	Commons	Lords Bill.	March 11	May 31	..	..	..
Chester Gas Bill	Lords	Comns. Bill	March 12	March 19	June 4	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 24	March 2	March 11	..
Cork Gas Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 1	..	..	..
Cork Improvement Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Dagenham and District Farmers (Optional) Sewage Utilization Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 17	..	..	..
Dartford Gas Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 15	..	..	..
Dearne Valley Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 16	May 25	..
" "	Commons	Lords Bill.	May 28	..	..	..	..
Denton and Haughton Gas Bill	Lords	Comns. Bill	June 1	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 16	March 17	May 31	..
Doncaster Corporation Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 16	May 25	..
" "	Commons	Lords Bill.	May 28	..	..	..	..
Eastbourne Gas Bill " "	Lords	Comns. Bill	May 27	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 25	March 12	May 25	..
Edinburgh and District Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	Feb. 26	March 2	..
" " "	Commons	Lords Bill.	March 5	March 15	June 1	..	..
Exmouth and District Water Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
Gaslight and Coke, Commercial Gas, and South Metropolitan Gaslight and Coke Companies Bill	Lords	..	..	..	..	..	..
	Commons	Feb. 9	Feb. 10	Feb. 17	..	..	..
Great Yarmouth Water Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 1	..	..	..
Hinckley Local Board Gas Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 8	..	..	..
Huddersfield Tramways and Improvement Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Hull Lighting Bill " "	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 19	Feb. 16	..	..	..
Hyde Gas Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
King's Lynn Corporation Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Lancashire County Justices (Water, &c.) Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 11	March 13	..
" "	Commons	Lords Bill.	March 16	..	..	..	..
Lancaster Corporation Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 16	March 12	..	..
Lincoln Gas Bill "	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 12	..	..	..
Liverpool Corporation Water Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 24	..	..	..
Liverpool United Gas Bill	Lords	Comns. Bill	May 28	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 24	March 12	May 27	..
London Gaslight Company Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 1	..	..	..
Maidstone Gas Bill "	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
Malton Gas Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 8	..	..	..
Oldham Improvement Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Phœnix Gaslight and Coke Company Bill	Lords	Bill with-	drawn.				
" "	Commons						
Portmadoc Water Bill " "	Lords	Feb. 10	Feb. 10	Feb. 16	May 31	June 3	..
" "	Commons	Lords Bill.	June 4	..	..	..	..
Prescot Gas Bill	Lords	Comns. Bill	May 28	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 23	March 12	May 27	..
Preston Improvement Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Rathmines and Rathgar Township (Vartry Water Supply) Bill	Lords	Feb. 16	Feb. 16	March 11	..	..	..
	Commons	..	..	..	..	..	..
Rathmines and Rathgar Township Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	..	..	..
" "	Commons	..	..	..	..	..	..
Reading Gas Bill " "	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 1	..	..	..
Rochester Corporation Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 16	..	..	..
Sea Water Supply to London Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 2.	Preamble	not proved.
" "	Commons						
Sligo Borough Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	..	..	..
" "	Commons	..	..	..	..	..	..
South Metropolitan Gas Company Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	..	..	..	..
Southwark and Vauxhall Water Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 23	..	..	..
Stafford Borough Bill	Lords	Comns. Bill	June 3	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 23	March 17	June 1	..
Wakefield Corporation Water Bill	Lords	Feb. 10	Feb. 10	Feb. 16	March 11	March 16	..
" "	Commons	Lords Bill.	March 18	..	..	..	..
Wandsworth and Putney Gas Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 2	..	..	..
Wigan Improvement Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	Feb. 17	..	..	..
Wrexham Water Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 4	..	..	..
Yeadon and Guiseley Gas Bill	Lords	..	..	..	..	..	..
" "	Commons	Feb. 9	Feb. 10	March 10	..	..	..

HOUSE OF LORDS.

MONDAY, MAY 31.

The Select Committee on the Sligo Borough Water Bill reported that they had not proceeded with the consideration of the Bill, no parties having appeared in opposition to it.

THURSDAY, JUNE 3.

The Chairman of Committees informed the House that the opposition to the Chester Gas Bill was withdrawn.

FRIDAY, JUNE 4.

A petition against the Prescot Gas Bill was presented from London and North-Western Railway Company.

LONDON WATER SUPPLY.

The Earl of CAMPERDOWN: My lords, the question of the Metropolitan Water Supply appeared last session in the shape of a Bill, which met with an untimely fate, and it now appears in the new Parliament in a different shape. I am not now going to make to your lordships a speech on the subject generally, but I simply wish to call your attention to one point in respect to this question, which, if not properly attended to at the present time, will in a short period naturally entail considerable additional outlay on the ratepayers of the Metropolis. I find that this question, which is now under the consideration of the present Government, has been taken up in a different shape, and last night a Select Committee of the House of Commons was appointed, and the question was referred to them in very wide terms. Now the first remark I have to make upon the terms of the reference to the Committee is this: They are to inquire into two or three subjects and have discussions upon them, which, if they progress with that want of rapidity that is usual with Parliamentary Committees, will make it highly improbable, and almost impossible, that the report should be received from them during the present session of Parliament; and even if the report should be made to Parliament this session, it will be next to impossible to introduce a Bill to enforce the existing agreements, or any modification of those agreements which may be found satisfactory; and, of course, if this inquiry takes place, and the agreements are not found to be satisfactory, the whole matter would be thrown over, and legislation deferred. In what state will the ratepayers then find themselves? I have submitted this question to your lordships because, after all, the case of the ratepayers is only at present half brought before you, and that part which is brought before you is the less important half. The more important matter to the ratepayers of London at the present time is, how are we to prevent new powers of rating at a far higher rate accruing to the Water Companies hereafter? My lords, I would point out to your lordships that the existing agreements—what I may term the inchoate arrangements—of the Water Companies will expire at the end of the present month, and if nothing should be done before that time, and supposing that the agreements are dead and are not to be renewed on the 1st of July next, the assessment that would come into force on that day will furnish new evidence of the value of the houses that are rated to the water-rates. So far as my experience goes, from what we have known to take place in former years, the ratepayers of the Metropolis will become liable to pay a still higher charge for their water supply, it being remembered that they will be supplied with exactly the same article; and the consequence will be that the ratepayers will find themselves landed in considerable difficulty. Under these circumstances, what we naturally look to is for the Legislature to protect us from such a state of things, which is certainly not the state of things that ever was contemplated at the time the Water Companies came into existence, and when the original undertakings were first begun. Next comes a question which we are bound to consider, and it is that wherever there is an increase of value, and a new assessment is made, the ratepayers would naturally be subjected to an increase in the amount of the rates. In my view it is the proper function of a municipal body to have the charge of this question; but, unfortunately, we are obliged to accept things as they are, and, as a matter of fact, there is no municipal body in London to take them up. No one who has the slightest experience could say that the ratepayers should be left unprotected; therefore there must be some power or some body of the Executive Government who should *primâ facie* have power to protect the London ratepayers. At present it does not appear to be the duty of any one to do so, and if, unfortunately, no notice should be taken of this matter, and no measure be passed during the present session of Parliament for the purpose of concluding such an agreement, the ratepayers will consider that, looking to the fact that this matter has been introduced at least two or three times to your lordships attention, their interests have been neglected, or at all events not been attended to, and they will feel some indignation, and not without reason. Therefore I wish to ask whether it is the intention of Her Majesty's Government to take any steps to protect the ratepayers of the Metropolis from arbitrary augmentations of assessment by the Water Companies, in the event of no fresh bargain being concluded with them during the present session of Parliament, or whether the Government propose to refer the whole Water Question, including the means of protecting the ratepayers, to a Select Committee of the House of Commons.

The Earl of FIFE: My lords, I am sure my noble friend will believe me when I say that Her Majesty's Government are as fully alive as he is to the necessity of consulting the interests of the ratepayers in this respect. It is certainly a most important subject, and I am fully aware of the great attention which my noble friend has given to it. I am sure he will bear me out when I say the question is one of great magnitude, as well as one involving many varied interests, both from a financial point of view, and in its sanitary character; and, therefore, it is no wonder that its settlement is attended with such great difficulty, and cannot be attempted without much care and deliberation. At this stage I cannot help thinking that I should be serving no useful purpose if, while the whole matter is in the crucible, I were to allow myself to be drawn into any general argument on the incidence of the water-rates of London. In regard to one point, however, I will venture to refer your lordships to the well-known case, bearing upon this question, of the *New River Company v. Mathers*. This case shows that whenever a ratepayer considers himself aggrieved in the matter of the annual valuation which a water company may arbitrarily fix, he is at liberty to have the annual value assessed by two justices. If this be so, then, I think, such a proceeding would prove a remedy for such an excessive demand as my noble friend seems to anticipate. I think also that we may gather from the remarks made last evening by the Home Secretary, in the House of Commons, that he is not prepared to see the water-rates in the Metropolis raised out of all proportion with the rest of the country, neither does he desire to close the door against any other more economical scheme of water supply being brought forward; and, if these objects can be attained for, say, 20 millions instead of 30 millions, I think that no one will regret the discussion which has taken place upon the subject. My noble friend seems to expect that people should step forward and deal with this question in a practical manner; but he does not seem to be aware that the Government are taking such practical steps. If the Government were to attempt to abrogate the present parliamentary rights of the Water Companies, it would be taking away from them a statutory right of property which they now have, and this I am sure your lordships will think would not be consistent with principles of justice, and would be a course of Government interference with lawful remuneration in cases of commercial enterprise. It is not by interfering with private rights that exorbitant charges can be met. That a remedy can and will be found I am quite certain; but it seems to me that it would be against all ordinary rules of justice to take away the rights possessed by these Companies. We know perfectly well that the City authorities have power to obtain a fresh water supply for London if they like, and therefore I think it will be better to abstain from any extreme measures. With regard to referring the matter to a Select Committee, I must remind my noble friend that the Committee to which it has been referred represents the whole of the ratepayers of London, and they are entirely in favour of the Metropolitan Board acting with the City Corporation and the Vestries for this purpose. Many of the recommendations which have been sent to the Home Office have been embodied in the recommendations to the Committee, and all I can say is that if, after the Committee have thoroughly investigated the question, and made their report to the Government, my noble friend is not satisfied with the report, he will stand alone in his opinion.

HOUSE OF COMMONS.

MONDAY, MAY 31.

A petition against the Liverpool Corporation Water Bill, and to dispense with the Standing Orders in respect to it, was presented from the Corporation of Oswestry.

The petitions were withdrawn, of North-Eastern Railway Company against the Malton Gas Bill; and of (1) Chester Water Company, (2) Brymbo Water Company, (3) Ruabon Water Company against the Wrexham Water Bill.

THE GOVERNMENT AND THE METROPOLITAN WATER QUESTION.

Mr. BRAND asked the Secretary of State for the Home Department whether the Government intended to introduce a Metropolis Water-Works Purchase Bill, with a view to refer the terms of purchase under the Water Purchase Bill in the last Parliament to a Select Committee; and if not, whether the Government would take any steps to maintain the basis of valuation upon which the Water Purchase Bill was framed, or to prevent the Water Companies from augmenting the nominal value of their property by charging extra rates upon any increase in the assessment of property by the new valuation now in progress under the Act of 1869, or by their own assessment other than new houses coming under supply.

Sir W. V. HARCOURT: As the question of my honourable friend involves large pecuniary interests, which might be prejudiced by a postponed or imperfect statement of the intention of the Government, I shall ask the indulgence of the House if what I have to say extends somewhat beyond the ordinary limits of an answer at this table. It may possibly be deemed convenient that I should take this opportunity of stating with precision the course which the Government intend to pursue with reference to the measure called the Metropolis Water Purchase Bill. It is within the knowledge of the House that a Bill was introduced in the last Parliament to give effect to certain agreements which had been negotiated with the Water Companies with a view to their purchase. That Bill came to an end at the dissolution, if not before. Most gentlemen present are probably acquainted with the circumstances which have cast grave doubts on these agreements, in regard to their prudence and the advantages to be derived by the public in carrying them into effect. It seems to Her Majesty's Government quite impossible to take any steps to give validity to these agreements without a public and searching inquiry into the real character of the documents, and their actual relation to the value of the property to be acquired under them. The Corporation of London and the Metropolitan Board of Works, the two most important representative bodies of the Metropolis, have addressed to me memorials desiring such an investigation, and have undertaken to render the requisite assistance in conducting it. In my opinion this is a most wise and reasonable request. Nothing short of such an investigation will satisfy the public mind as to the true character of these agreements, and of the property with which they deal. The Government will, therefore, ask the House to appoint a Select Committee to carry out this inquiry. The exact terms of the order of reference are matters of some difficulty. It is obviously not expedient to give the inquiry too large a scope, so as to hang up this urgent question indefinitely. The inquiry into the agreements can be brought into a moderate compass, so as to be disposed of in the present session. An investigation of the whole question of water supply would evidently extend to far wider limits; at the same time it would not be possible or desirable to exclude from the mind of a Committee appointed to examine the proposed terms of purchase, the consideration of the question whether the purchase of the undertakings of the existing Water Companies is in itself the only or the best possible alternative, and whether it might not be more desirable to obtain from other sources a better supply at a cheaper rate. There is another question the Corporation in their memorial point to as a subject for inquiry, namely, the basis of the charge for water—*i.e.*, the basis on which the powers of the Companies are founded, and which enables them to raise their water-rents, without limit, in proportion to the growth in the value of houses, without themselves expending any further moneys or rendering any additional services. That likewise seems a matter deserving of inquiry and redress. In conclusion, I only wish to say one word as to the attitude of the Government towards this question. As respects the agreements, they accept no responsibility in regard to them. As they are to form the subject of a public inquiry, it is not desirable that I should even express at this moment the opinion I entertain of them. The Government will lay them impartially before the Committee, neither as attacking nor as supporting the agreements, but prepared to deal with them as may seem best, after their true value has been ascertained. I presume they will be explained to the Committee by the gentleman who negotiated them, and who will not be the witness of the Government. They will be criticized, tested, and sifted by the representatives of the Corporation and the Board of Works. What course the Water Companies may think fit to take with regard to them I cannot at this moment say, as I have not received any communication from them. But, of course, every facility they may desire will be placed at their disposal in order to state their case as they may think fit; and by this means the Committee will be enabled to form a sound judgment on the matter of the agreements. With reference to the whole question of the Water Supply of the Metropolis, I would observe to the House that it is not *primâ facie* an Imperial question which belongs strictly to the province of the Executive Government. It is, and ought to be, if the proper machinery were available, a question of local metropolitan administration. On this, as on many other subjects, we have to deplore the want of a central metropolitan authority for the general government of London. That is a great and urgent question, and I hope that this Parliament will not close without making an earnest attempt at its solution. But in the meanwhile it is the duty, as it is the wish of the Government to assist the inhabitants of London in supplying the defects of their local organization. I have thought that the best avail-

able means in the present instance was to invite the co-operation of the Corporation and the Metropolitan Board to aid the Government in a solution of the difficult matter we have to deal with. I am happy to say that this appeal has been cordially responded to. Both these great bodies, representing the inhabitants of London, have expressed their willingness to co-operate with the Government and with one another before the Committee. This seems to me a good augury for the future, and it is in such a combination that I see the best hopes for dealing hereafter, in an adequate manner, with a matter which so deeply concerns the health and wealth of this great Metropolis.

TUESDAY, JUNE 1.

The King's Lynn Corporation Bill, the Rochester Corporation Bill, the Maidstone Gas Bill, and the Great Yarmouth Water Bill were referred to a Select Committee, consisting of Mr. Dodds (Chairman), Mr. Schreiber, Mr. Justin M'Carthy, Mr. Northcote, and Sir John Duckworth (Referee); to meet on Tuesday, June 8.

The Hull Lighting Bill, the Wigan Improvement Bill, the Hyde Gas Bill, and the Ackworth, Featherstone, Purston, and Sharlston Gas Bill were referred to a Select Committee, consisting of Lord Eustace Cecil (Chairman), Mr. W. C. Cartwright, Mr. Brodrick, and Mr. Grafton; to meet on Wednesday, June 9.

The Cork Gas Bill and the Wrexham Water Bill were referred to a Select Committee, consisting of Mr. Abel Smith (Chairman), Mr. Samuelson, Lord Moreton, Baron de Worms, and Mr. Bonham-Carter (Referee); to meet on Wednesday, June 9.

The Huddersfield Tramways and Improvement Bill, the Preston Improvement Bill, and the Oldham Improvement Bill were referred to a Select Committee, consisting of Colonel Loyd-Lindsay (Chairman), Mr. Tillett, Mr. A. Grey, and Sir William Palliser; to meet on Thursday, June 10.

LOCAL GOVERNMENT (GAS) PROVISIONAL ORDER BILL.—This Bill was read a second time, and committed.

LIVERPOOL CORPORATION WATER BILL.—This Bill was specially committed to a Select Committee of nine members, five to be nominated by the House, and four by the Committee of Selection.

THE WATER SUPPLY AT LONDON FIRES.

Mr. S. BALFOUR asked the Secretary of State for the Home Department if his attention had been directed to the proceedings, as reported in the *Standard* newspaper of the 27th of May, at the inquest held on the death of two men by fire at North Woolwich, when all the witnesses complained of the lack of water; several of the jury said that the water service, which was nominally constant, had been practically no supply at all for a fortnight; and the Coroner remarked that he had just seen children begging for water at the railway station: And if he would direct inquiries to be made on the subject, and take such steps as might be necessary to compel the Metropolitan Water Companies to fulfil their statutory obligations to provide a sufficient supply of water for the extinction of fires.

Sir W. V. HARCOURT said, with respect to the first part of the question, that he had received a letter from the Coroner, dated the 31st of May, and stating that according to the accounts of various persons who attended the inquest in regard to the death of the two men who lost their lives by the fire referred to, the report in the *Standard* was perfectly correct, that it was clear no water was to be had on the occasion, and that the supply of water at Silvertown was most insufficient, while sometimes there was no supply at all. With respect to the second part of the question, he (Sir W. V. Harcourt) was sorry to say that the statutory power alluded to did not exist. From the report of the Fire Brigade Committee it appeared that the Companies were controlled in common by certain general enactments; but, subject to these, were governed by their own special Acts, having a separate system of pipes, and peculiar regulations suitable to their own circumstances; that none of the Companies were under obligation to provide water sufficient for the extinction of fires, all that was required of them by the general enactments being that they should allow the gratuitous use of their water for that purpose, and grant certain special facilities; that under the special Acts they were treated as mere purveyors of water for ordinary consumption, considering solely the convenience of their customers and the profit of their Shareholders; and that therefore what was needed for the extinction of fires was an immediate and ample supply of water at high pressure. This, he believed, was a true statement of the existing law on the subject, and he thought it was one of the most unsatisfactory features of the present Water Supply of the Metropolis.

WEDNESDAY, JUNE 2.

The *locus standi* of (1) Roger A. Rashbotham and (2) C. F. O. Davis (for himself and Eliza Flint) and William Johnson, as petitioners against the Wrexham Water Bill, was disallowed.

GAS AND WATER ORDERS CONFIRMATION BILL.—This Bill was read a second time, and committed.

THURSDAY, JUNE 3.

LIVERPOOL CORPORATION WATER BILL.—On the motion of Mr. DODSON, the Committee on this Bill were nominated—viz., Mr. Stevenson, Mr. Joseph Pease, Mr. M'Lagan, Sir Gabriel Goldney, and Mr. Knowles.

LONDON WATER SUPPLY.

Sir W. V. HARCOURT, pursuant to notice, moved—"That a Select Committee be appointed to inquire and report as to the expediency of acquiring, on behalf of the inhabitants of London, the undertakings of the existing Metropolitan Water Companies; and also to examine and report whether certain agreements, or any of them, already entered into provisionally for the purchase of these Companies would furnish a satisfactory basis for such an acquisition; and further to inquire and report as to the nature and extent of the powers of the Water Companies to levy water rates and rents, and how far it may be desirable to modify the same."

Sir R. A. CROSS: I am glad to find that the right honourable gentleman has come to an understanding with us. The first point is that he has apparently come to the conclusion that this matter is one of considerable difficulty, that there are a number of points which require most careful consideration, that it is not a question to be dealt with at hap-hazard by any manner of means, but that it does require great care, and is a very difficult question to deal with, especially considering the fact of the number of Water Companies which supply water to the Metropolis, and also the fact that in the Metropolis there is no body to undertake the whole supply of water. I am also glad to find that the right honourable gentleman has not the slightest idea of treating this matter as a party question. I have always, throughout all the negotiations, endeavoured, so far as was possible, to divest it of all party aspects of every sort or description. The right honourable gentleman must know that the first person to whom I applied for assistance in case the Bill of the late Government should be read a second time was the present Foreign Secretary, in order obtain his assistance in nominating the Committee. I did that for the purpose of shewing my anxious desire that no party bias should be displayed in forming the Committee, and therefore I can assure the right honourable gentleman at the present moment that all my friends on this side of the House will be perfectly willing and ready to give him all the assistance possible in order to bring this matter to a satisfactory conclusion for the benefit of the Metropolis. I observed in the somewhat elaborate statement the right honourable gentleman made to the House the other day, in answer to a question, certain remarks to which I wish to make allusion. I observed that the right honourable gentleman very properly congratulated himself, and put it to the House as a matter for congratulation, that he had secured the co-operation of the Corporation of the City of London and the Metropolitan Board of Works in the undertaking. But the way in which this was put, and the suggestion that it was a good augury for the future, seemed to me to imply that the right honourable gentleman thought that this was the first time those promises had been made. I can only say, in justice to myself and to the Corporation of the City of London, and also to the Metropolitan Board of Works, that this was very far from being the case. I myself took them into communication, and I found them most ready to offer every facility for the passage of the Bill. I should be wrong if I did not at the present moment state that I have always received from the Corporation of London the greatest possible assistance in many ways, and my honourable friend who presides over the Metropolitan Board of Works I have always found, as well as the Board, most ready and willing to give the Secretary of State every possible assistance in any matter which interests the Metropolis. I only wanted to guard against the supposition that to consult the Corporation of the City of London and the Metropolitan Board of Works was a new idea. Now there are two classes of persons who, it appears to me, were conspicuous by their absence from the statement of the right honourable gentleman. One of these classes of persons I will call the outsiders. The right honourable gentleman must be perfectly aware that there are a very large number of persons who live outside their areas, but who are within the metropolitan water area, and I am surprised that in the statement of the right honourable gentleman there is no reference to consumers of water outside the areas of the City and of the Metropolitan Board of Works. I was also more surprised that the right honourable gentleman appeared to take it as a matter of satisfaction to himself that he had had no communication with the Water Companies. I am glad it was a satisfaction to him, but I was surprised at the absence from his statement of those persons outside the metropolitan water area, and also the Water Companies themselves. The right honourable gentleman then said that there were two questions to be considered. One was whether the present supply of water was the best that could be obtained, and if not, whether, as an alternative, a better supply could be secured elsewhere at a cheaper rate. Now I think the right honourable gentleman must have forgotten for a moment the deliberations of the Select Committee upon that very question. He must have forgotten that the Committee of 1877, of which my right honourable friend the member for Westminster was Chairman, came to the conclusion that it was to the interest of the Water Companies to take action themselves. No doubt the right honourable gentleman is perfectly well aware that I did not at all say that such a plan was not possible, or that it was not justifiable to undertake such a work. Still, there are very great practical difficulties in the way of it; and while you have these Companies still existing, I do not think the language of the right honourable gentleman would lead persons very readily to embark in a Company which has this object in view. I also think it would be unfair to the ratepayers and to the water consumers to have, in addition to the existing water supply, another scheme, at an expense of 11 or 12 or perhaps 20 millions, for bringing water from elsewhere; at all events, it would not cheapen the supply of water to incur this expense. And I must say also that there are some practical difficulties in the way of laying the mains through the streets. I rather gather from the statement of the right honourable gentleman that it has occurred to him that this was entirely a new proposition, whereas I may say that it has been considered for a long time. With every wish to give all possible assistance to the right honourable gentleman, I should like to make one or two observations as to his propositions. And, first, as to the proposal that a Select Committee should be appointed to inquire into the expediency of acquiring the existing undertakings of the Water Companies within the present area. I presume this means whether it is expedient to buy them, or to get somebody else to buy them. I understood that it was not expedient to give the inquiry too large a scope, or to hang up this urgent question for too long a time. The more years you allow the Water Companies to remain in their present position, the more you must be prepared to see an increase in the value of their property—an increase amounting probably to about a million a year. For example, some time ago the Companies laid out a large sum of money to enable them to provide for supplying the large number of additional houses now being erected every year in the Metropolis. Within the last year or two I believe that not less than 60 miles of new streets have been made, and there is no doubt that the increase in the income of each of these Companies is such as to raise the value of their property very much year by year. If it is not expedient to make this inquiry too large, what are the Committee to do? Are they simply to go in a perfunctory manner through all the materials which are already at hand? or are they to go into the question whether water can be brought from anywhere, and if so, at what cost? If they are to undertake this, I think it will be a very long and a very expensive inquiry; and I do not see what the right honourable gentleman means when he states that it is not expedient to give the inquiry too large a scope, and yet says, almost in the same breath, that this is a question which they must consider. I should have thought that this was a matter which the Government could have settled amongst themselves without a Committee; but, of course, it may be that they do not wish to take any responsibility on themselves. If the Committee are to make an accurate report, I venture to say that it will be a long, a careful, and an expensive inquiry, if the report is to be of any value whatever beyond the reports which we have already; because we had the matter most carefully discussed before a Committee only two years ago, and that Committee inquired into all the plans. If these are to be rediscussed at any considerable length, it will be a very tedious inquiry. Now, the reference says, "to examine and report whether certain agreements, or any of them, already entered into provisionally for the purchase of these Companies would furnish a satisfactory basis for such an acquisition." If it is expedient to purchase at all, of course there are only two ways in which you can do it—namely, by agreement, or by compulsion subject to arbitration. If you are to purchase by agreement, there must be two parties to the agreement. If you are to purchase by compulsion, you go to the arbitrator, and are left entirely in his hands. If you are to do it by agreement, both parties must be agreed, and it is of no use for a Committee to say that they think the value is any particular sum if the Companies say they will not sell their undertakings for this sum. If you are not agreed, you cannot buy except by compulsion; and if you have compulsion, you cannot buy at your own price, but you must go to an arbitrator. It is therefore difficult to see what is to be the advantage of the Committee saying what in their opinion is the actual value of the Water Companies property, when you have no power to enforce the Committee's report. This really was the sole principle of the Bill of the late Government;

that is to say, it was agreement and nothing more. The whole spirit of the Bill was that you should purchase the Water Companies property by agreement—that you should be free to purchase it by agreement in the first instance, if satisfactory terms could be arranged between the water consumers and the Companies. I quite agree that the Government are in an awkward position in taking up this matter, because they do not like to take upon themselves to buy for the water consumers when the ratepayers are not parties to the bargain; and if the late Government had brought in a Bill to enforce with all their strength any such bargain that had been made, I think they would have been justly open to a great many remarks which are now unjustly made against them. But that was not their course at all. Their course was to see how low they could get the Companies to fix the price, in order to talk the matter over in a committee-room with the water consumers, the Metropolitan Board, and the City of London. These agreements were understood perfectly well, and were entered into with the distinct understanding that they were to be subject to the most rigid scrutiny by a Select Committee, and if the Committee had reported that they thought the price too high, the House would no doubt have rejected them. If, on the other hand, the Committee thought the terms were such as could properly be accepted, they would have asked the House to pass the Bill. Or there was a third course—that when the Companies had explained their case before the Committee, and when the Metropolitan Board and the water consumers had explained theirs, if the Government had thought that any lower terms might be had in any of the cases, and the Companies had consented to agree to them, then the terms might be accepted and become law. But the Bill was not to be withdrawn except at the request, not of one, but of a majority of the Companies concerned. I regret very much that the Companies and the consumers did not have the opportunity of talking the matter over before a Committee of the House of Commons, for it is no very easy matter to bring a company on the floor of the House, and it was with the greatest possible difficulty that the Water Companies were brought here. I only make these remarks for the purpose of stating that the Committee will enter upon this inquiry with the disadvantage that they will not have the Companies before them willingly—I mean, they will not have them there as willingly as they would have come with their agreements ready to prove their case.

Sir W. V. Harcourt: If the right honourable gentleman will excuse me for a moment, I should like to know what his view is upon this point. As I understand, these agreements are binding on the Companies till the end of the session, and if the conclusion of the Committee were that the agreements were good agreements, and the Government were willing to introduce a Bill to carry them into effect, the agreements would still be binding on the Companies.

Sir R. A. Cross: The right honourable gentleman does not quite understand what I mean. The arrangement originally was that a Bill should be brought in to give effect to these agreements, and that the Bill should be referred to a Select Committee. I am not at all clear that the Companies, if they chose, might not say to you, "There are our agreements, and we have nothing more to say." I still hope, however, the Companies will come before the Committee, and if so that some arrangement may be arrived at. The last part of the reference is to "inquire and report as to the nature and extent of the powers of the Water Companies to levy water rates and rents, and how far it may be desirable to modify the same." I was very glad to see that if the right honourable gentleman is correctly reported, he himself has given an answer on this subject, almost exactly in the same terms as one I gave in the last session of Parliament. When I gave that answer it was considerably cavilled at by many members of the House. I am glad to find that, having looked into this point, the right honourable gentleman is of the same opinion that I was—namely, that you must use great caution in invading rights conferred by Act of Parliament. I am not at all saying that the Acts of the Companies are Acts such as they ought to have had. Parliament, in its wisdom at that time, granted to many of them rather extraordinary powers; but it is not the question whether Parliament would grant those powers now. We have to deal with them as they are. Power was given to the Companies to charge upon the actual value of the houses supplied. As I read the right honourable gentleman's remarks, I think he said it was a mistake to think that an alteration of the assessment altered the legal right of the Companies, and it was also a mistake to think that Mr. Goschen's Act at all affected this question. The question is, what is the annual value at which the Companies charge? and that is a question which has to be decided on appeal before certain justices appointed for the purpose, and it is a question of evidence what the annual value of a house may be. The right honourable gentlemen went on to say—and I agree with him—that although he would do all in his power, as I would do all in my power, to prevent any injustice being done, or any undue advantage being taken of an Act of Parliament, he did not know anything more unsafe in this country than to make people suppose that the securities given to persons in their properties by Act of Parliament were not safe, and were liable to invasion. I think I have quoted his words correctly. It gave me great pleasure to read that he made that statement. It is the only statement I should have expected from such an accomplished lawyer as he is, and from one so thoroughly cognizant as he is of matters of this kind; and I hope it will be a very long time before this House invades the rights of people in that way. Having pointed out what I think the difficulties of the Committee will be in this matter, I can only repeat that I most sincerely hope its object will be accomplished. I believe the wisest course will be that the property of the Water Companies should be purchased. I hope that the Companies will come before the Select Committee and argue the matter out, and that the question may be settled before the close of the session. I will give every assistance in carrying out so desirable an object; but as to the first part of the reference I cannot help pressing upon my right honourable friend that I think it would be wise to limit the words in some shape, because I think if the Committee once enter on this large and interesting question, they will not reach their report for a very long time. There is one part of the subject that the right honourable gentleman has not alluded to, and that is the constitution of the body which would have to administer these water properties if bought on behalf of the Metropolis. The right honourable gentleman has entirely absolved himself from any responsibility in this matter, and it is quite clear the Government have not the slightest desire to take any; but I am surprised that silence has been kept on this point. In the Bill laid before the House by the late Government an elaborate Water Trust was proposed; but there was one principle then for the first time enunciated, and I hope that, in the formation of any body for the purpose of carrying out arrangements for a water supply, this principle will be kept in view. We laid it down that we ought, on such a Trust, to have a direct representation of the Metropolis. That is the only principle that will work with satisfaction. So far as the elective members are concerned, there should be direct and not indirect representation. I think it always one of the great faults in the constitution of the Metropolitan Board of Works that its election is indirect, and I should be sorry to see any other body of that description set up without a recognition of the principle of direct election. I do not wish to detain the House any longer. I can promise my right honourable friend that he will have every possible assistance from me in his endeavours to arrive at a proper conclusion.

Mr. Ritchie thought the course taken by the Government in this matter was somewhat instructive. The House would remember that there was nothing on which speakers upon Liberal platforms throughout the country spoke with more scathing denunciation than the so-called utter inability of the late Government to manage any kind of domestic legislation, and the mode in which they dealt with the water supply. The late Government were said to have been drowned with water. Water was made to account for the Dissolution; and naturally, when all these denunciations came from the Opposition, those who were interested in the Metropolitan Water Supply expected that the first thing the new Government would do would be to introduce a comprehensive scheme, dealing with this question in an entirely different manner from that in which it had been treated by the late Government. But when the new Ministry came in, the right honourable gentleman the Home Secretary, from the way in which he received deputations, seemed by no means to have made up his mind as to the right plan to pursue, and appeared to be fishing all round for advice as to the proper mode of dealing with this question; and now the Government had practically brought forward a proposition which was identical with that for which the last Government were so roundly denounced. He did not object to the reference of these agreements to a Select Committee, for that was probably the best course that could be taken, but he did object to the reference to the Committee being laden with other matter which, in his opinion, could only have the effect of hanging up the water question for an indefinite period. Had the Committee been limited to an investigation of the agreements, their labours might have been brought to a speedy conclusion; but the right honourable gentleman proposed to ask the Committee to go into the enormous question of whether or not it might not be better policy to bring in a fresh supply of water altogether. This would necessarily involve immense investigation and a vast expenditure of time, and the result would be that nothing could be done this session, and probably nothing in the next. If the Committee simply reported on the question whether the agreements were good agreements or not, there would be plenty of time after that to draw attention to the question whether something might be done to obtain water elsewhere. Instead of waiting for a report on the possibility of modifying the existing agreements, the right honourable gentleman had seen fit to overload the reference to the Committee, so that delay was unavoidable. As a representative of the Metropolis, which had been for years crying out for the Government to take steps in this matter, he must protest against anything that would lead to further delay in the settlement of this important question; and even now he hoped the right honourable gentleman would see his way to making some amendment in the terms of the reference, so that the question of whether or not the agreements were proper agreements, or whether they could be modified, should be alone placed before the Committee. The longer this matter was hung up, the more the Metropolis would certainly have to pay. He understood that at any moment the Water Companies might, under their Acts, put up their rates. They had not even to wait for the re-valuation of the Metropolis. That re-valuation would take place, as a matter of course, next year, and the Companies would only be acting strictly within their rights if they raised their rates when the valuation was increased. All these considerations ought to influence the Government in making the reference as simple as possible, so that some settlement might be arrived at, and so that they might see whether any reasonable bargain could be made with the Companies. Then, if it were found that no satisfactory bargain could be concluded, he still thought there would be ample time to take other steps to provide the Metropolis with a fresh supply of water. This should only be done if the Water Companies would not listen to reason; but the question should first of all be referred to the Committee, whether a satisfactory bargain could not be struck.

Mr. Brand said that the objection which had been mentioned by the right honourable gentleman opposite, and by the honourable member for the Tower Hamlets, had also struck him very forcibly—namely, that the terms of the reference to the Committee seemed to open a very wide and exhaustive field of inquiry. He should have thought that the question contained in the first paragraph of the motion was a foregone conclusion; that was, whether the Water Companies were prepared to accept such terms as the House would offer. There was another point—viz., that in the reference it seemed to be open to the Committee to inquire as to the character of the existing source of supply. This was a question which had been decided, or at any rate inquired into, by the Commission of 1869. That Commission issued a very exhaustive report, and he thought they had all the facts before them on which to form a conclusion on the point. He therefore wished to ask his right honourable friend the Home Secretary whether it would not be possible to narrow the inquiry by simply referring to the Select Committee the report of the Royal Commission of 1869, so that they might have cognizance of the opinion which was expressed at that time. With reference to the raising of the rates by the Water Companies, it would be in the recollection of the House that he put a question to his right honourable friend on this point the other day, and he quite admitted with the right honourable gentleman opposite, and with his right honourable friend, that there might be some questions which should be asked privately by private members, and which it was not in the interests of the public directly to answer. Nevertheless the putting of those questions sometimes had the desired effect, and he thought at any rate it was clear that the Water Companies would understand that Parliament would look with great disfavour on any attempt to raise their rates after that discussion.

Sir H. Holland said he heartily joined in the request that the Home Secretary would, if possible, reconsider the terms of the reference to the Committee. He certainly understood the right honourable gentleman to deprecate any extended inquiry, and he understood that he was extremely anxious to come at once to terms with the Water Companies. It was quite clear, however, that the Committee could not help, under this reference, considering any plan which might be brought before them. He (Sir W. Holland), as a Director of a Water Company, naturally felt much interested in the question of expense, because they knew what the expense of the Royal Commission of 1869 had been. It was something enormous, and if the Committee were now to go into all the matters that were brought before the Royal Commission, and settled by that Commission, they would naturally feel very anxious about the expense to which not only the Water Companies, but also the ratepayers, would be put. He earnestly hoped the right honourable gentleman would alter the terms of the reference, and confine it to the question of whether the agreements before the House should be acted upon, or whether other terms could be made with the Water Companies, and if so, what terms. He believed himself that the Companies would meet the House in a fair and open spirit, and at the same time he thought that if the Committee were to go into the general question of the supply of London with water, they would never come to the end of it—at any rate, not this session. It was very important to the Companies as well as to the ratepayers, because at the present moment the Companies were stopped from making any contracts because of the indefinite and uncomfortable position in which they were placed. He could not at all agree in finding fault with the Home Secretary for not

having exercised sufficient despatch in this matter. He considered the right honourable gentleman would have been very unwise in having at once dashed into the subject without consideration, and he, for one, was heartily glad the agreements were to be referred to a Committee.

Sir W. V. Harcourt: I am rather surprised that an honourable member representing the Water Companies should desire that we should proceed in any other manner than by inquiring whether any action shall be taken at all on this question. I must say this, that I cannot undertake any responsibility in the matter of this Committee, unless I am allowed to keep it as an open question whether the supply of the existing Water Companies is or is not one that is worth buying. If the House is of opinion that this is not open, I will have nothing to do with the question. The Corporation of London and the Metropolitan Board of Works have told me that this is the condition of their co-operation. The point of their contention is that the water of the Thames is not worth having, and this is the assumption that they proceed upon in the first instance. To exclude, therefore, this first inquiry is to make it worthless. I will be no party to this inquiry if I am to have one of my arms tied behind my back. I consider that the question of an alternative scheme, and the use of it, is the only way of dealing with these Companies, and those who desire to exclude it from the Committee would absolutely give the monopoly to the Companies, and prevent the inhabitants of London from being supplied with fresh water on reasonable terms.

Sir H. Holland: What I thought was that the first thing should be to determine what terms, if any, should be made with the existing Companies; but I did not say that you could not after that decide whether or not to buy the works.

Sir W. V. Harcourt: It may be the fact that you may buy these things on reasonable terms, but they may not be worth buying at all. It will be for the Committee to consider whether the undertakings are worth buying at any price. I must ask the House to allow the reference to remain as it is, or else I must wash my hands of the whole question. The information contained in the report already published may lead the Committee to a sound conclusion on the subject, and they may refer to it or not as they please; but the matter must be open to their own judgment. The first and preliminary question to determine is whether the works of the Companies who supply water from the Thames are worth buying at all; and after that, if you see that they are worth buying at a reasonable price, then the logical course would be to inquire whether the price is reasonable or not. This appears to me to be the only course to be taken. I consider that the question of whether or not London is to be supplied from the Thames at all, or whether for 20 millions you can have a better and a more abundant supply of water than you can get for 30 millions from the Companies, is the question the Committee have to consider.

Mr. W. H. Smith: I am sure that if the right honourable gentleman is able to get a good supply of water for 20 millions, he will confer a great benefit on the Metropolis. Speaking as one of the representatives of the Metropolis, I am sure he feels he cannot escape his responsibility in regard to the question. He finds these agreements before him which were intended to be the basis of an Act of Parliament, subject to negotiations, and subject also to evidence and discussion before the House of Commons; and the right honourable gentleman I am sure feels that on him will rest the responsibility of this scheme, whether it results in a larger sum being paid for the water of London than if these agreements were dealt with in the manner contemplated by the late Government. The question is a very important one; it cannot be long delayed, and upon the mode in which it is treated very great and serious results depend. It appears to me that the Committee ought to enter upon the discussion of this question with their hands perfectly unfettered, and with full liberty to consider the whole subject. They should have the power to say to the Water Companies, "Your terms are perfectly unreasonable, your water is not good, and we must consider in what way we can supply the Metropolis with water." But it is quite another matter to invite the Committee to consider a different and a much larger question, and one which might occupy their attention for some years. It is the duty of the Metropolitan Water Companies to make provision for the supply of water, under certain Acts of Parliament, to the whole of the Metropolis. They must come to Parliament sooner or later for further powers to expend money, which to a very large extent involves a charge upon the Metropolis. A delay in dealing with this question means the compulsory expenditure of a very large amount of capital this year, next year, or the year after, under the Companies Acts of Parliament. I think, therefore, that the Government are responsible for seeing that the question is dealt with with the least possible delay. It certainly cannot be dealt with by saying, "The terms are ridiculous, the water is bad, and we will go elsewhere to obtain a supply." You must always bear in mind that the powers possessed by the Water Companies have been given to them by Acts of Parliament, and all experience is against the withdrawal of powers which have been deliberately given by Parliament to public companies, and where a large capital has been invested, without compensation, which in this case would come very heavily indeed on the rates. My own opinion is that if an Act of Parliament is passed to send the matter to an arbitrator, the Metropolis will have to pay very heavily. I have in past years had experience in arbitration cases in which Parliament had conceded rights, and this experience leads me to go against such a plan being resorted to in the present instance.

Mr. Onslow said that having been a member of the Committee on Fires in the Metropolis, when the question of the water supply came before the Committee, he should like to say a few words. The reference said "to inquire and report as to the expediency of acquiring, on behalf of the inhabitants of London, the undertakings of the existing Water Companies within the Metropolitan area." Supposing the Committee should find that it was not expedient to acquire the works of the existing Water Companies, would they be precluded from going into the question of a fresh water supply? How were they to be able, under the terms of reference, to go into the question of a new supply of water? He would press on the Home Secretary that on the Committee no one should be appointed who had any shares in a Water Company in London.

Mr. Fawcett: May I say, Sir, that I served on an East Indian Railway Committee last year, which raised a question of as large an amount as this—I think it was £32,000,000. In the appointment of that Committee I believe you ruled that it would be contrary to the practice of the House that any one should be on the Committee who had any pecuniary interest whatever in the railway; and, therefore, as this is a question of the possible purchase of the metropolitan water undertakings, I should suppose the same rule would hold, and that it would be impossible for any one to serve on the Committee who is, directly or indirectly, pecuniarily interested in the Metropolitan Water Companies. I believe your ruling, Sir, went to this, that an honourable member of this House was advised that he could not serve on the Committee because he was interested in the Company simply as a trustee.

The Speaker: There is no doubt that the general principle is that no member who is directly interested can serve upon either a public or a private Committee. I do not propose to answer this question at once, without knowing the nature of the interest which any honourable member may possess.

Sir R. A. Cross: As far as any member on this side of the House is concerned, that question has been looked into, and no one will be appointed on the Committee who is so interested.

The motion was then agreed to.

Friday, June 4.

The Standing Orders Committee recommended, and it was agreed, "That, in the case of the Liverpool Corporation Water Bill, petition of the Corporation of Oswestry for dispensing with Standing Order No. 129 in the case of their petition against the Bill, the said Standing Order ought to be dispensed with."

Liverpool Corporation Water Bill.—The Committee of Selection added the following members to the Select Committee on this Bill:—Mr. Sclater-Booth, Mr. Blennerhassett, Sir John Lubbock, and Earl Percy.

Legal Intelligence.

DUDLEY POLICE COURT.—Monday, May 24.

(*Before Messrs.* J. Aston *and* C. Cochrane.)

THE DUDLEY GAS COMPANY AND THE CORPORATION.

The Dudley Gaslight Company and their Secretary (Mr. T. Collett) were summoned, at the instance of the Corporation, for "that they, on the 3rd of March, 1880, unlawfully did not keep and sell to Edward Marcus Warmington (the Town Clerk of Dudley), who applied for the same at their office, a copy of the annual statement of accounts of the said Company, made up to the 31st day of December, 1877, in the form, and containing the particulars specified in schedule B to the Act of 34 & 35 Vict., cap. 41.

Mr. Hugo Young, instructed by the Town Clerk, appeared for the Corporation; and Mr. R. C. E. Plumptre for the Company.

Mr. Young, in opening the case, said this was an application for the payment of penalties by the Dudley Gas Company, for not furnishing to the applicant, Mr. Warmington, certain accounts which they were bound by statute to keep. He (Mr. Young) understood that there would be no question of fact here disputed, and it would be simply a question of law as to whether a general Act of Parliament, called the Gas-Works Clauses Act, 1847, and the Amendment Act of 1871, did or did not apply to the Dudley Gas Company. In order to put the matter clearly before the Bench, it would be necessary for him to refer to the various sections of different Acts of Parliament under which the Company took their powers, and to the provisions of which they were subject. It appeared in the first instance that, amongst other Acts which were incorporated in the Dudley Gas Act of 1853, was the Gas-Works Clauses Act of 1847, which was amended by the Gas-Works Clauses Act of 1871. These were model Acts, embodying certain clauses for the convenience of incorporation with certain other Acts, and the former was specifically incorporated with the Dudley Gas Company's Act of 1853. Now, section 30 of the Gas-Works Clauses Act, 1847, simply provided that the Company should not pay a greater dividend than 10 per cent., and he referred to this just to show the interest the public had in the accounts being kept and furnished when required. Section 38 of the same statute provided that yearly accounts should be furnished to the Clerk of the Peace of the county, and he thought they might take it that, independently of the Amendment Act of 1871, which partly applied to the Company, this would be the only obligation under which the Company furnished any accounts at all. Now, by section 49 of the same Act, it was enacted that nothing therein, or in the special Act (that was the Company's Act of 1853), should be deemed to exempt the undertakers from any general Act. He drew special attention to this section, as showing in fact that no special Act should make any sort of provision by which it could exclude itself from being bound by any subsequent general Act which might be passed. This was the position in which the law stood down to 1871, when the Legislature thought that their model Act of 1847, which had been incorporated with the Dudley Gas Company's special Act, needed amendment, and therefore they set to work to amend it, so that in future it should apply to all gas companies trading under special Acts of Parliament. The first section of the 1871 Act was to the effect that it and the Gas-Works Clauses Act of 1847 should be construed together as one Act; and the question in this case was whether the Amendment Act applied to the Dudley special Act, which incorporated the Act of 1847. Independently of the 49th section of the 1847 Act, which had been incorporated, and to which the Company had made themselves liable, they had, in effect, enacted in their own special Act that they should be subject to any subsequent general legislation affecting gas companies. Therefore, by this section, even standing by itself, they would be subject to the Act of 1871, which was a general Act. But, in addition to this, he said further that the 1847 Act, as amended by the 1871 Act, was gone entirely, except so far as it stood side by side with the 1871 Act, and anything additional which was added to the 1871 Act was to all intents and purposes part of the 1847 Act, and, therefore, if they chose, in a certain sense the 1871 Act was incorporated with the Dudley Company's special Act. Now section 3 of the Act of 1871 provided that its provisions should apply to every gas undertaking authorized by any special Act thereafter passed, or by any Provisional Order made under the Gas and Water Facilities Act, 1870. It said positively that in future these general Acts should *ipso facto* be incorporated with the special Act, whether the undertakers chose it or not. This being so, the 35th section of the 1871 Act provided that every year, before the 25th of March, an annual statement of accounts up to the 31st of December next preceding should be made in the form given in a schedule, and that the undertakers should keep copies of such statement at their office, and sell the same to any applicant at a price not exceeding 1s. for each copy; and in case the undertakers made default, they should be liable to a penalty of 40s. for each day during which such default continued. It was for this penalty that these proceedings were taken. Mr. Warmington applied to the Company for the accounts, which were refused him simply because they had not been kept and could not be furnished. He (the learned counsel) then went on to quote the decision of Justices Lush and Quain in the case of the *Commercial Gas Company v. Scott* as analogous, contending that by the express words of section 49 of the Act of 1847, which the Company of their own free will incorporated, they had made themselves subject to any future general legislation affecting gas companies. Therefore, they were bound to supply their accounts in the prescribed form. He believed the total amount of damages at £2 a day would amount to £150, and though he should not ask for that penalty, he should certainly wish for some substantial fine to be imposed.

Mr. Plumptre, for the defence, admitted that the application for the accounts was made on the 3rd of March, and refused because no accounts under the Act of 1871 had been kept by the Company. He argued at length that this Act was not retrospective in its operation, and contended that the case of the *Commercial Gas Company v. Scott*, quoted by his learned friend, was not on all fours with the present case. The principle of the whole question was simply this: Were the Company bound by the Act of 1871? They contended that they were entitled to carry on business as

they always had done, under their own special Act of 1858 and the general Act of 1847. As to the case already cited by Mr. Young as conclusive in his own favour, he might remark that it was upon the language and construction of the Metropolis Gas Act of 1860 that that case turned, and upon that alone, and as far as it was an authority upon the point before the Bench, it was only so by inference both in regard to himself and his friend. But the Dudley Gas Company had their own private Act of 1853, upon which they took their stand. It had been suggested that they were affected by public legislation; but he ventured to submit that this was a wrong principle. Unless express words could be found, private legislation was not to be interfered with or annulled by public legislation.

Mr. Young, in replying, said the question arose, what was the distinction between private and public legislation? He found on looking at the Metropolis Gas Act of 1860 that the words used were exactly the same as those in the Dudley Company's Act of 1853. If legislation were carried on in this way, there would be two sets of gas companies in the country—one set furnishing accounts, the other none at all.

The Bench, after a consultation, held that the Act of 1871 was to be read with the Act of 1847, and therefore the Company were liable.

Mr. Plumptre then took an objection that the information for the summons was laid too late. The offence was committed on March 25, 1879, and the plaintiffs made application on March 3, 1880, to have the accounts for 1878. He further contended that as the accounts did not exist, the Company could not be liable to fine, the offence being based upon, and presupposing the existence of the accounts.

Mr. Barradale (the Clerk) advised the Magistrates that they were in time, because the period was not from the date when the accounts should have been made up, but from the time the Town Clerk applied for them.

Mr. Young having pointed out that the Company were required to send in the accounts within six months to the Local Authorities, and keep copies of the annual statement for the convenience of any ratepayer,

The Bench imposed a penalty of £50 and costs.

Mr. Plumptre applied for a case, and this was granted.

WARRINGTON BOROUGH POLICE COURT.—Monday, May 24.

(Before the Mayor and a Bench of Magistrates.)

what is a domestic supply of water?

The Warrington Water-Works Company were summoned at the instance of Messrs. Robinson, Son, and Skinner, flint glass manufacturers, for that they, "being the undertakers within the meaning of the Water-Works Clauses Act, 1847, did unlawfully refuse to furnish Thomas O'Neill, the occupier of a private dwelling-house within the limits of the Warrington Water-Works Act, 1855, in a street in which a main or other water-pipe of the Company was laid, with a sufficient supply of water for the domestic purposes of such occupier, contrary to the provisions of the Warrington Water-Works Act, 1855, and the Acts incorporated therewith."

Mr. Heywood appeared for the complainants, and Mr. Taylor for the defendants.

Mr. Heywood, in opening the case, said the complaint was made under the 63rd section of the Warrington Water-Works Act, 1855, which stated that the Company should, at the request of the owner or occupier, furnish to every occupier of a private dwelling-house, or part of a dwelling-house, in any street within the limits of the Act, a sufficient supply of water for domestic purposes. He believed the only question to be decided was whether the occupier of a lodge attached to Messrs. Robinson's premises, was to be construed to be an occupier of a private dwelling-house within the meaning of the Act.

Mr. Taylor: That is one question only.

Mr. Heywood said the facts of the case were these: Prior to December, 1877, Messrs. Robinson were the owners of this particular property, or the tenants for the time being, and they were in the habit of getting water from the Company, not only for the purposes of the lodge, which he would presently describe, but for the use of the men in the works and for trade purposes. In December, 1877, for various reasons—one being that the water from the Mersey was so much better for their purposes, being much softer, they laid pipes to the river, and thence obtained a sufficient supply of water for their requirements; and since then they had continued to use river water. It was very important that this fact should be pointed out to the Bench, because from the date named hostilities commenced between the Company and Messrs. Robinson—in fact, much had been done by the former to annoy the complainants. The works of Messrs. Robinson extended over a considerable area, and on the ground floor there was what he had called a lodge. It was not a lodge in the ordinary sense of the term, but a house for a lodge-keeper. There were four rooms on the ground floor of the house. There was an entrance to it from the street, and there was also a door from the kitchen into the passage leading into the yard of the works; but there was no communication with the rooms above, which were used as offices. In December, 1877, Messrs. Robinson ceased to take the water for what he would call purely manufacturing purposes, but continued for some time longer to take it for the supply of the lodge-keeper's house, for the water-closets, and for drinking purposes for the men. In the beginning of 1878 Messrs. Robinson sank a well, and being satisfied with the water obtained, determined to discontinue the supply from the Company except for limited purposes. A lengthy correspondence took place between the Company and Messrs. Robinson, and the former made several suggestions as to the terms upon which the water could be supplied to the works; but complainants stated distinctly that they only intended to take water from the Company for use in the lodge-keeper's house, which had always been treated as a separate dwelling or occupation. The Company now denied they were bound to supply the lodge, and he (Mr. Heywood) took it that the only question to be decided was, whether or not the lodge was a separate dwelling. He concluded that something would be said about a proceeding which was certainly a very extraordinary one. Having been unable to make an arrangement with Messrs. Robinson to take water for the use of the men, &c., the Company one day put down a meter in the street near the house. They made no communication with Messrs. Robinson, or the occupier of the lodge, with reference to the matter. The meter remained there for several months, and then, without any intimation to any one, the Company cut off the communication, and had since refused to supply water. The question of waste of water had never been urged by the Company as a reason for adopting such a course. The learned counsel then read the correspondence which had taken place between the Company and the complainants, and proceeded to say that the only ground, as far as he could see, upon which the defendants refused to supply water was that they were of opinion that the lodge was not a private dwelling-house under their Act. This was the ground of dispute, and he did not propose to deal with any other question at present. The lodge was a tenement that entitled the occupier to a vote at parliamentary and other elections. There was a door leading into the works, but it was entirely for the use of the lodge-keeper, who lived in the house with his wife. Of course, it was necessary he should occasionally go to the office, and a door had been put up for his convenience. No person had a right in the house without his permission, so it was as much a separate dwelling-house as the flats in Edinburgh or Paris were. There was no communication between the upper and the lower floors; but the Company claimed a right, if they supplied the lodge, also to supply the whole of the works. He submitted that this was an erroneous conclusion to draw.

Mr. Davies (the Magistrates Clerk): Is the contention merely that water shall be supplied to these four rooms constituting a private house?

Mr. Heywood: Certainly.

Mr. Davies: The supply is for private domestic purposes?

Mr. Heywood thought he had made it clear what his argument was. With regard to the four rooms, he contended the Company were bound to provide a supply of water under the Act, because the lodge was the home of the keeper and his wife. He was clearly a person entitled to be supplied with water for domestic use. The Company contended that the lodge was not a private dwelling-house or part of a private dwelling-house, but it must be a dwelling-house because a man lived in it. The question was, "Is it or is it not a private dwelling-house" because it happened to have offices over it? He contended that this did not alter its character, and that it was a private dwelling-house within the meaning of the Act; and it was clear, therefore, that the Company were bound to provide a proper supply of water for domestic purposes. The Bench might inflict a fine as well as a continuing penalty of 40s. a day, but the complainants did not ask them to inflict the latter, because he had no doubt that if the decision went against the Company they would at once give way and supply the water.

Evidence was then called in support of the complaint.

Mr. *William Robinson*, a member of complainant firm, said when they ceased to take the Company's water he gave instructions that no water from the main should be used in the works. He was never informed, before the pipe was cut off, of any complaints by the Company. They had an ample supply, without using the Company's water, for everything in connection with the works. In the accounts sent in by the Company the lodge was always charged as a separate item.

Mr. Taylor (in cross-examination): After you ceased to pay £27 a year to the Company for their water you obtained your supply from the Mersey?

Witness: Yes.

I may assume that the workpeople did not drink the Mersey water. How then did you propose to supply them with water for drinking?—From a bath spring. We made a cistern for the water to run in.

Did your workpeople drink that water?—They drink no other that I am aware of.

Do you mean to say that you have not the slightest suspicion about your men getting any water but from the well or from the lodge?—They have certainly not had any from the lodge.

Between April, 1879, and the time the water was cut off from the lodge, which was in April, 1880, did you give any orders to the workpeople or to any person that they were not to use any of the Company's water?—I might have done; I am not sure.

I am to understand that you never had any suspicion that the men were drinking the Company's water after April, 1879?—I certainly had no suspicion.

In further cross-examination, witness said he was away at the time the meter was put down, but he heard of it on his return. He did not say anything about it. As the water was cut off from the works he told the lodge-keeper that he had no right to give any of the Company's water to the workpeople.

The witness was also cross-examined at length as to the construction of the lodge and its use. He admitted that in a scullery connected with it they kept the gas-meter for the works, which was attended to by the lodgeman, who was paid by the week, the house-rent being reckoned as part of his wages. If they dismissed him, they would require him to go out of the lodge.

In re-examination, witness said no one in connection with the works had any right to go into any of the rooms of the lodge without the lodge-keeper chose.

Some further unimportant evidence having been given,

Mr. Taylor addressed the Bench on behalf of the Company, and at the outset argued the question whether the lodge was a private dwelling-house within the meaning of the Company's Act of Parliament. He quite agreed that the lodge-keeper was the occupier of part of Messrs. Robinson's works, but he was not the occupier of a private dwelling-house. The man paid no rent, had no right to any exclusive occupation of the place, and could be turned out at any moment.

The Mayor: His rights cannot be infringed upon by the public.

Mr. Taylor: Not by the public.

Major Cartwright: The question is whether his employer would have power to go into his house.

Mr. Taylor: I say he can. It is simply a permissive occupation. Mr. Robinson says to the man, "I will give you 20s. a week, and you may have the use of that place."

The Mayor: I have a coachman, and he occupies a house on my land. I would never think of going into his cottage.

Mr. Taylor: But you can say at any moment, "Out you go."

Mr. Crosfield: There has been no evidence given to show that the man is liable to be turned out of the house at a moment's notice, and without any compensation for rent.

Mr. Taylor: Mr. Robinson himself said the house is part of his wages. So it is with a domestic servant. If you turn a cook away she loses her board and lodgings; and yet the law, as I understand it, is perfectly well established that you can at any moment say to a domestic servant, "I don't like you. Here is a month's wages; you must leave my house." None of us would think of going into the bedrooms of our domestic servants, yet they are just as much private as this is. This lodge is a portion of the works, the same as a bedroom is part of a house. If it is not part of the works, why do they have placed there the meter which registers the gas used over the whole of the works? There is not a single fact in the whole of the case which supports the view that it is this man's dwelling-house. It is not for me to impute any blame to Mr. Robinson. I assume that he gave directions that the Company's water was not to be used on the works, but that does not prevent it being used. We have been told that a meter was fixed up at the lodge, and this was done because the Company had good ground for believing that the water was being used otherwise than it should be. The result was found to be as follows:—From May 19 to June 14 the quantity used was 55 gallons per day; from June 14 to Aug. 18 it was 15 gallons a day; from Aug. 18 to Sept. 29 it was 333 gallons; from Sept. 29 to Oct. 8 it was 444 gallons; from Oct. 8 to Oct. 23, 600 gallons; from Oct. 13 to Oct. 21 it diminished to 486 gallons.

Mr. Bleckly: Was there any leakage? At our works we have seen the consumption rise from 60,000 to 170,000 gallons, and we say there must be a leakage somewhere.

Mr. Taylor said where there was a large area they knew there must be leakage, but all this pipe had to do was to go through 18 inches of wall. If there was a leakage, it would have gone on increasing; but what happened was just the reverse, as it diminished slightly towards the end of October. Was it likely that the lodgekeeper and his wife would take the trouble to go into the yard to get pump water for the use of the men when they could get the Company's water nearer at hand? From some

reason or other, there was an undoubtedly undue consumption of water, and under these circumstances the Company were entitled to cut off the supply.

The following evidence was then called for the defence:—

Mr. *Berry*, the Superintendent and Manager of the Manchester Corporation Water-Works, said he had been in the service of the Corporation for 30 years.

Mr. TAYLOR: Now tell me what is the proper consumption for two persons—a man and his wife.

Mr. HEYWOOD: I submit that the question is entirely irrelevant to the case. Mr. Berry has, no doubt, had a large experience, but the average consumption of water by a family in Manchester has nothing to do with the consumption in Warrington.

Mr. DAVIES: Mr. Taylor says, "We go on the ground of undue consumption," and he proposes to prove this by saying that 600 gallons was the daily consumption. I have no hesitation in saying that the question is admissible.

Mr. TAYLOR: What should be the consumption where people live in lodgings, and do not wash at home?

Witness: 14 gallons per day is the maximum.

The witness was not asked any further questions.

Mr. *Ross*, the Secretary to the Company, was then called, and said he directed the meter in question to be fixed, as well as the cutting off of the supply of water on the 21st of October. He believed the meter registered correctly. The meters were tested, but he could not tell whether this particular one was. The supply of water was cut off on account of undue consumption. The quantities of water consumed were taken by two of the Company's workmen, who reported to him. The supply was cut off by order of the Directors.

Mr. HEYWOOD: How is it you have not mentioned the question of undue consumption in any of your letters to Messrs. Robinson?

Witness: I have nothing to do with Messrs. Robinson. This was water supplied to the lodge.

You had nothing to do with Messrs. Robinson, then?—I simply cut off the water as directed by the Act, without notice.

What made you suppose a greater consumption of water was going on than was usual?—Because we could not see how the hands could get water other than by taking it from the lodge.

I understand that, during the whole of the time the meter was down, you took the register day by day?—Yes.

And when the consumption rose to 333 gallons per day, did you go to Messrs. Robinson and point the fact out to them? Do you say that the water was fraudulently taken?—I cannot say that.

And you never thought fit to tell Messrs. Robinson of the large consumption?—I never do in cases of this sort.

Why did you not sooner cut off the water, because 600 gallons a day was a pretty stiff figure?—The consumption was allowed to go on for a certain period to make sure of it.

The case for the defendants closed by two witnesses being called to depose as to the fixing of the meter and the correctness of its registration.

Mr. DAVIES having advised the Bench that there could not have been undue consumption of water without some knowledge on the part of the consumer,

The Magistrates retired to consider their decision. On their return, in about a quarter of an hour,

The MAYOR said: It appears to the Bench that the lodgekeeper is the occupier of a house within the terms of the Company's Act of Parliament, and that he is entitled to the water supply asked for.

Mr. TAYLOR intimated that the Company would appeal from this decision. Whereupon, after some further discussion,

The BENCH decided to inflict a penalty of 50s. and costs, the defendants agreeing to take no objection on appeal as to the amount of the penalty.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

DEPUTATION TO THE HOME SECRETARY.

On Tuesday last a deputation representing the various Vestries and District Boards of the Metropolis waited upon the Home Secretary, and presented a memorial urging the passing of a Bill without delay suspending until the end of the next session of Parliament the power of the Water Companies to augment the charge made by them for the water supply of property in the Metropolis.

Mr. FIRTH, M.P., introduced the deputation.

Mr. BEAL said the memorial of the delegates was rather weakened by what had taken place the previous night in Parliament. What had been said in the House, they thought, perfectly met the wants of the public; but if the report of the Select Committee should favour purchase, while desiring to deal with the matter with the greatest justice, they strongly condemned a price which, from the fluctuations on the Stock Exchange, showed that a huge bargain in the interest of the Companies, and not in the public interest, had been made. What was wanted was a good supply of potable water. The public right in competing in the supply must also be recognized. It was anticipated that a claim for increased rates under the increased valuation would be made, and it was desirable that this should, if possible, be prevented.

Other members of the deputation having spoken,

Sir W. V. HARCOURT, in reply, said: I have to thank you for the indulgent manner in which you have spoken of my efforts to deal with this question. I naturally came to the matter with but limited experience, and therefore I look forward to the assistance of the Select Committee which will be moved for in Parliament, upon which it will be the object of those who have to deal with the matter to place the most competent men who can be found, in order that this question may be discussed from every point of view. I will not enter into any detail now, because, as I gather from you, the views that I have expressed are not in any way discordant with those you entertain. I have had the opportunity of expressing those views to Parliament and to the Metropolitan Board of Works, who represent, after all, similar interests to those which you represent. I know that a strong feeling exists that the first step taken should be a suspension of the existing powers of the Water Companies. Now, I need not say that Parliament and every man in this country would be extremely cautious not to overrule rights conferred by Act of Parliament, except in cases of grave necessity. I desire fully to appreciate and to know what are the real facts of the case, and, with regard to these Companies, to consider what remedy may be applied, before having recourse to such an extreme measure as repealing rights of property conferred by Act of Parliament. That is not the first step which every one would be disposed to take. I find that there exists an impression that these powers depend upon the Assessment Act; but this is not the case, the real power being to charge upon the actual value of the house; and, whether the assessment be raised or not, the Companies can only charge on the value of the houses. It is a mistake to suppose that the assessments alter the legal right, although, no doubt, they operate in the nature of evidence, and justify and induce the Water Companies to raise their charges. However, as I stated in Parliament yesterday, I propose that one of the principal subjects for inquiry by the Select Committee shall be the power of raising rents by the Companies, and the manner in which those powers have been exercised. After inquiry into these matters, we shall be in a better position to deal with the question than if we rushed at it in a hurry. I am sure Parliament will take care that no injustice is done to the inhabitants of the Metropolis. If a remedy cannot be found in one way, it will be found in another; but you must give us time to examine the question in all its bearings, and I suppose you will not complain if we do not at once seize upon what may appear the most ready method, but take a little time in order to see if we cannot accomplish our object without taking steps which might alarm people as to the security of their property. Nothing could be more undesirable than to lead people to suppose that the security given to them in their property by Act of Parliament is not safe, but is liable to be invaded. These are the reasons which make me pause. I am much obliged to you for coming here, as it strengthens the hands of Ministers to have such support. All I have to say now is that if in the course of the inquiry by the Committee you are able to put any question, or to make any suggestion, we shall be happy to consider it.

The deputation thanked the right honourable gentleman, and withdrew.

COURT OF COMMON COUNCIL.

At the Meeting of the Court last Thursday—the LORD MAYOR presiding—on the Remembrancer suggesting, in view of the present aspect of the Metropolitan Water Question, the advisability of obtaining the opinions of financial and scientific experts on the subject, for the purpose of producing evidence before the Parliamentary Committee,

Mr. MASON moved—"That a Select Committee, consisting of twelve members of this Court, be appointed to consider the Metropolitan Water Supply Question and the preliminary agreements relating thereto, with power to take such part as they may think expedient in the inquiry before the Select Committee of the House of Commons, reporting thereon from time to time to a Committee of the whole Court."

Mr RUDKIN seconded the motion, which was carried, on the words "the Court sitting *in camerâ*" being substituted for "a Committee of the whole Court," at the end of the motion.

WIMBLEDON LOCAL BOARD.—At a meeting of the Wimbledon Local Board on Wednesday last, it was resolved—"That a memorial be prepared and forwarded to the Home Secretary, requesting that, in the consideration of any measures or investigations which may be proposed or undertaken with reference to providing the Metropolis with a purer and more efficient supply of water, or preventing any undue increase of charges made by the Water Companies, the interests of Wimbledon and other suburban areas beyond the jurisdiction of the Metropolitan Board of Works may be taken into consideration.

The following are the returns of the Society of Medical Officers of Health on the Composition and Quality of the Metropolitan Waters in May, 1880:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.—As Nitrates, &c.	Ammonia.—Saline.	Ammonia.—Organic.	Hardness (Clark's Scale).—Before Boiling.	Hardness (Clark's Scale).—After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	18·78	0·027	0·148	0·000	0·005	14·5	3·0
West Middlesex	18·83	0·035	0·148	0·000	0·009	14·0	2·8
Southwark and Vauxhall	19·42	0·039	0·148	0·001	0·005	14·3	2·8
Chelsea	19·91	0·043	0·159	0·001	0·008	14·3	2·8
Lambeth	19·33	0·039	0·148	0·000	0·006	14·6	3·0
Other Companies.							
Kent	20·61	0·003	0·410	0·000	0·004	20·0	5·6
New River	17·72	0·016	0·137	0·000	0·006	14·6	3·0
East London	18·56	0·027	0·159	0·000	0·009	14·6	3·3

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, Chelsea Water-Works Company.

C. MEYMOTT TIDY, M.B., &c.

BURSLEM TOWN COUNCIL GAS SUPPLY.

At a Meeting of the Burslem Town Council last Wednesday—the MAYOR (Mr. J. Maddock) presiding—the minutes of the Gas Committee, which were presented, incorporated the report of the Gas Manager (Mr. H. Peaty) as to the past year's working, the results showing a profit of £2465 5s. 1d., being an increase of £398 2s. 7d. over that of the previous year. The Committee recommended that a sum not exceeding £2000 of these profits be placed at the disposal of the Council in aid of the rates.

Mr. W. WOODALL, M.P., in proposing the adoption of the report, remarked that twelve months ago he had congratulated the Council upon the report the Gas Committee then presented, when £1700 was handed over from the gas profits in aid of the rates. This year there had been an increase in gas-rental of nearly 6 per cent., and he was happy to say that on the management account there was shown an increase of 19 per cent. upon the previous year, enabling them now to recommend the appropriation of £2000 in aid of the rates. It must be remembered, however, that at the present time they were certainly conducting their business under what might be regarded as exceptionally favourable conditions. The price of coal, &c., was much in their favour, but it would be idle to shut their eyes to the fact that they might, in years not very far distant, probably be subject to an increase in the cost of coal, &c. It would, therefore, perhaps be injudicious to rely too absolutely upon such large sums being appropriated from gas profits in aid of the rates. The policy of the Gas Committee had been to maintain the works up to their full structural value, but it was felt by the Committee that it was very important for them, by improvements here and there as were found necessary, to compensate for the sensible depreciation which was always going on in connection with such works. The Committee, therefore, proposed to set apart, out of the profits, a fund to meet this depreciation. During the four years that the works had been in the hands of the Council the total profits had exceeded £5000; but, as they were aware, no provision was made for a trading capital, and they had had to avail themselves of their credit at the bank, causing a very considerable charge from year to year for interest. A large amount had also had to be expended for obtaining the Act of Parliament sanctioning the purchase of the works, and for the necessary loan to complete the purchase. They were, however, slowly accumulating a trading capital, and the balance owing to the bankers was decreasing; which, together with the fact that last year they had been able to appropriate £1700, and this year £2000 in aid of rates, led him to think they

had reason to be satisfied with the progress of the gas-works, and to feel that the Council were justified in purchasing them.

Mr. SMITH seconded the motion, which was carried.

Mr. WOODALL then said that some time ago the Gas Committee indicated to the Council their willingness to make a reduction of 5s. per lamp in their charge for lighting the public streets; but a very general feeling had been expressed in favour of the lamps being lighted during the whole of the year, instead of for ten months of the year as at present, and in the Committee's last report it was intimated that they were willing, though it was worth more, to light the lamps for the whole year at the same price that had hitherto been charged for ten months. He therefore moved that the Gas Committee be instructed to light the lamps during the whole of the year upon the terms named.

Mr. BALL seconded this motion, which was also carried; and the Council proceeded to other business.

WEST OF SCOTLAND GAS MANAGERS ASSOCIATION.

(*Continued from p.* 841.)

At the conclusion of the discussion on Mr. Niven's paper, reported in last JOURNAL, Mr. J. MAYER (Glasgow) read the following paper on

PAINTER'S HYDROSTATIC JOINT FOR GAS AND WATER MAINS.

In scanning the technical journals in my professional capacity, my attention was recently arrested by brief illustrated notices of an invention* which seemed to me to possess such a degree of novelty and scientific excellence, that I at once resolved to make further and more minute acquaintance with it, in order that I might, if possible, bring it under the notice of the members of the West of Scotland Association of Gas Managers at this their eighth annual meeting, providing, of course, that the proposal to do so should meet with the approval of the executive officers, in their efforts to cater for the professional instruction of the members generally. The invention is the fruit of the busy brain of Mr. William Painter, an American engineer, hailing from the city of Baltimore; and it may be spoken of as a totally new mode of forming joints in cast-iron pipes, either for water or gas—a mode which substitutes hydrostatic pressure for the ordinary hemp and lead joint, in which the caulking is done by hand labour. When we bear in mind that the question of leakage or the unaccounted-for gas is so constantly giving untold annoyance and anxiety to gas managers and their employers, the directors of gas companies or works committees of gas corporations, no excuse need be offered for bringing the subject before such a meeting as the present, except that the person who has had the temerity to do so can lay no claim to be regarded as a practical man. But I ventured to offer my services to introduce the subject to your notice, because I knew that there was no "practical" man in connection with the Association who could undertake the duty from any knowledge of, or experience with the invention in actual practice. So much, then, by way of introduction. Let me now proceed to describe this novel invention in pipe-jointing, and indicate what seem to be its scientific merits, and what are believed or known to be its practical and economical advantages.

The invention is essentially a lead joint which is caulked by hydrostatic pressure, and the method of producing it is not only novel and eminently practicable, but it is one which is attended with great economy, in addition to which it retains all that is valuable in the lead joint caulked in the ordinary way, and at the same time introduces many important and valuable advantages. First of all it is desirable to notice that the socket or faucet end of the pipe is cast with a circumferential groove in its inner surface, which should be about ½-inch square in cross section for a 6-in. pipe, and varying in size with the size of the pipe. This groove has rounded corners, and opening into it there is a threaded hole which is intended for receiving the screw of a brass funnel, and subsequently a cast-iron screw plug. In this groove a gasket or ring of lead is cast so as to be flush with the inner surface of the socket; and this ring eventually becomes the caulking material. It is formed or cast by first firmly laying the pipe with the hole in the socket directly upwards, then introducing into the socket an expanding ring made of sheet steel about 2 inches broad, and covering the space taken up by the groove, and afterwards pouring into the latter the necessary quantity of molten lead by means of the brass funnel just spoken of. The expanding ring of steel, it should be mentioned, is provided with two fixed handles, so attached that when manipulated they cause the ends to overlap, and the ring to fix itself in the position and manner desired. It is covered with two layers of ordinary roofing felt, the outer one so arranged that, when burnt, it can be replaced in a few seconds. The lead is poured into the funnel quietly and steadily, neither too fast nor too slow, thus giving time for the air to escape, and avoiding the chilling of the lead. After the lead has "set," the funnel is unscrewed, the effect of which is that the "gate" breaks off just at the junction with the ring; and a smart blow removes the "gate" from the funnel. The expanding ring is now removed from the socket of the pipe, and the cast-iron screw plug is inserted into the hole, leaving the pipe complete and ready for laying. The pipes should be furnished by the founders fitted with the lead rings or gaskets, as also with the threaded cast-iron plug, for by such an arrangement all the usual cumbrous melting appliances and time-killing manipulations by a special gang of workmen are dispensed with in laying the mains. This is certainly an important advantage.

For general convenience, it is desirable to have the ends of the pipes of standard proportions, so that those of the same internal diameter may all be interchangeable. Of course, the strength of the pipes may be varied to suit special circumstances, without affecting the established dimensions. The size and shape of the groove for the gasket or lead ring, as also its distance from the outer end of the socket, are fixed for all sizes of pipes. Furthermore, the diameter and pitch of the screw hole are the same in all sizes of pipes, so that the chills used in the casting operation and the forcing jacks (shortly to be spoken of) may fit any pipe; but the length of the screw plugs varies according to the size of the pipe.

The end of the spigot is devoid of the usual bead, and in order to compensate for its absence, that end of the pipe is slightly increased in diameter; in this way a certain amount of clearance is allowed all round between the spigot and the socket — say, $\frac{5}{32}$ of an inch — and easy entrance is secured. The amount of the clearance may be varied from, say, ¼ in. to $\frac{1}{8}$ in., without materially affecting the quality of the joint; but $\frac{5}{32}$ in. in diameter (or $\frac{5}{64}$ in. all round) is to be considered the standard which gives the best results. Should the spigot rest upon the bottom, and all the clearance be at or near the top, or the reverse, the joint will still be perfect, as a sufficient amount of lead in the groove is provided for. In inserting the spigot end of one pipe into the socket of its fellow, it is guided into concentric position by the conical or tapering form of the interior of the latter; and this is true, whether the sections be joined in line with each or at a considerable angle.

I shall now proceed to show how the gasket or ring of lead occupying the groove in the socket comes into play to bring about the desired degree and kind of caulking required. When a pipe has been laid in position in the trench with its spigot end pushed home into the socket of the contiguous pipe, and the screw plug removed from the threaded hole formerly spoken of, a semi-fluid material is introduced, and made to exert a great degree of pressure by means of a forcing-jack which fits into the screw. This material finds its way between the lead gasket and the bottom of the groove, partially displacing the gasket therefrom, and forcing it inwards into tight contact with the spigot at all points of its circumference, thus forming a solid and perfect joint. The forcing-jack is now removed, and the screw plug is again inserted, thus completing the operation, which, in the case of a 12-inch main, need not occupy more time than about five minutes. The enormous hydrostatic pressure thus brought to bear on the lead gasket thoroughly imbeds it against the surface of the iron, causing it to conform perfectly to every inequality, spreading it laterally, and fixing it immovably in the groove. In its effect the operation just detailed is similar to that of caulking by hand, with the important advantages, however, that the pressure is here applied in exactly the proper direction to be most effective, and is absolutely uniform at every point. All the lead of the ring is utilized in making the joint; there is no dead or inactive and useless material, as in the ordinary method. The actual amount of the tight contact surface of the gasket is a width of about $\frac{3}{8}$-in., which is considerably more than is obtained in a hand-caulked joint. It should not be supposed that the permanent tightness of the joint is dependent upon sustained pressure within the groove; for such is not the case. The function of the forcing material is only to transmit the force exerted through the jack to all points of the gasket, thus spreading and caulking it solidly between the spigot and socket of the two contiguous pipes. When this is done its function ceases, and no further pressure of the forcing material upon the gasket is required. The object of the screw plug henceforth is simply to close the hole and retain the material in the groove. The forcing material is of a very simple and comparatively inexpensive character. It consists of three substances—tar, whiting, and sharp sand. The tar is boiled down to the consistency of soft pitch or thick treacle, and the whiting is then sifted free from lumps and stirred in so as to thicken the tar to the consistency of dough or soft putty; lastly, the sharp sand, to the amount of about $\frac{1}{10}$ to $\frac{1}{12}$ of the whiting used is mixed with it, the object being to choke up any small escapes that might occur in forcing up the gasket. In cold weather, the forcing material or semi-fluid should not be thicker when used than soft-working oil putty. It is packed ready for use in paper tubes or cartridges, of the proper size to fit the cylinder of the forcing-jack.

A few words may now be said by way of describing the screw-jack and the mode of using it. As at present constructed, it weighs nearly 50 lbs., but it will probably be reduced several pounds by making it entirely of steel. It consists of a hollow stem, with a screw at the bottom, fitting into the threaded plug-hole, which is the same in all sizes of pipes, and at the upper part there is a cylinder which contains the charge of semi-fluid material. Handles are fixed into the cylinder portion of the instrument, and, by means of a fixed nut and screw, a piston is forced upwards, when the handles are turned, and thus the charge of tarry material is expelled through the hollow stem behind the lead ring. The nut is split so as to save time in returning the piston to the first position in re-charging the cylinder. At first it was provided with a gauge to register the amount of pressure employed, but as that was found to be unnecessary it is now left off entirely, and the jack is so proportioned that it requires an ordinary man to exert about his full strength when seating the ring firmly. The operation of jointing is done without the employment of any direct heat; no skilled labour is required; and the time required for it does not need to exceed one-twentieth of that usually occupied in the operation of making a joint. In referring again to the manner in which the pressure is exerted and the result attained, I think I may say that advantage is taken of the law of the flow of solids, which was so thoroughly and beautifully worked out some years ago by the eminent French *savant*, General Morin. The lead of the ring or gasket does really seem as if it were made to flow, judging by the shape which it eventually takes by the application of the hydrostatic pressure applied in a very simple, but at the same time most efficient manner. As the lead has practically no elasticity, it displays no tendency to return into the plug-hole on the withdrawal of the screw-jack. The system employed leaves no room for imperfect work, and it provides against any loss through leakage.

There are many advantages which this system of jointing gas and water mains seems to possess, and which, indeed, have in practice or by experiment been demonstrated. They may be grouped as economical advantages and practical advantages. Referring to the former, it may be claimed that the hydrostatic joint requires less than one-third of the lead and about one-tenth of the labour employed in the ordinary hand-caulked joint, while the immense saving of gas (when the pipes are used for that purpose) is unquestionable, being due to its uniform and permanent tightness. As regards the saving of lead, a reference to the following table will prove very instructive:—

Diameter of pipes—*Inches*	2	3	4	6	8	10	12	15	18	20	24
"Hydrostatic" joint—*Pounds of lead*	1	1¼	2	2¾	3¾	4½	5½	7¼	8¾	9¾	11
Caulked joint—*Pounds of lead* . .	1¾	2¾	4	7	10½	14½	19½	28¼	32½	35¾	48

No packing with hemp or other material, with its attendant labour, is required. Then, again, no enlargement of the trenches is needed opposite the joints, and hence there is less back-filling and re-paving necessary. There may be a slight increase in the cost of casting the pipes, but, if so, it must be very small; against which there is the fact that the average weight per lineal foot, for a given thickness, is really lessened, by reason of the socket not being necessarily as deep as is usually the case in hand-caulked joints. There is, consequently, not only large economy in material and labour in forming the joints, but the cost of the pipes themselves is likewise actually reduced.

The following are amongst the practical advantages, in addition to one or two that may have been incidentally noticed in my previous remarks:—(1) Less width required in trenches, thereby saving excavating, refilling, and paving. (2) Sockets of less depth, hence a saving in iron and carriage. (3) Pipes may be laid at greater angles, and deflection after laying will not cause leakage. (4) Contraction and expansion, or vibration from street traffic, &c., does not affect its permanence. (5) Water in trenches will not prevent laying of pipes, and they may also be readily laid across water-courses. (6) Labour required in making the joint is less, and any kind of labour may be used. (7) Hydrostatic pressure being used, the gasket is forced home uniformly, thus affording no opportunity for imperfect work. (8) Pressure resulting from fluid conveyed in the mains tends to caulk the gasket tighter, therefore no risk of blowing out. (9) The period of obstruction to traffic is materially lessened. (10) The cost of yarn, fuel, and labour in melting the lead is avoided. (11) Amount of lead used in making this joint is less than one-third that usually required. (12) The hydrostatic joint combines great economy with all the requisites of a perfect joint.

Discussion.

The PRESIDENT: I am sure you will all agree with me that Mr. Mayer has made a good appeal for Painter's hydrostatic joint. The jointing has every appearance of making a good job, and I think that in districts such as ours it should become immensely successful. I should say, however,

* See JOURNAL, *ante* p. 250.

that the running in of the fillet will be as difficult as the making of a joint is at present, because you would require to have the face of the pipe protected by some clay fillet, so as to get a space filled up.

Mr. MAYER: I stated very distinctly that casings are cast previously in the foundry.

The PRESIDENT: I do not very well see that. One thing that is claimed for Painter's joint is the saving of expense. Now, before a fillet could be cast and applied in the foundry, there would be as much expense incurred as in making a lead joint in the main.

Mr. NELSON: May I ask if the groove is cast or turned in the faucet of the pipe?

Mr. MAYER: I understand the groove is cast, and forms part of the pipe from the first.

Mr. NELSON: There is a practical difficulty here, but probably they have a different way of working in America. It is quite impossible that the core can be drawn out of a mould. I rather think that it is turned, as I can see a difficulty in drawing a pipe either vertically or horizontally with a groove like that in it.

Mr. ROBERTSON said it was not necessary to draw the pipe.

Mr. BRODIE said there was no difficulty so far as this was concerned. He did not see how the length of the faucet could be reduced without impairing its efficiency.

Mr. STEWART: What about this steel ring?

Mr. MAYER: The steel ring is in absolute contact with the inner surface of the faucet, and serves instead of ordinary clay.

Mr. STEWART: I do not see the object of the steel ring. Do you withdraw it before putting in the pipe?

Mr. MAYER: The steel ring is withdrawn after the lead has set.

Mr. DONALDSON: Then it is simply a binder?

Mr. M'GILCHRIST: Or plays the part of an ordinary clip.

Mr. STEWART: As I understood, you put this on the pipe, then you run in the space with lead, then withdraw the clip as soon as the lead is cold, put in a pipe, and afterwards run in the composition and press it in by your process. There is as much trouble here as with the ordinary joint. I do not see any saving.

The PRESIDENT: That is just the point I wished to bring out.

Mr. MAYER: The statement has already been made that the joint is turned and finished for introduction. One joint can be made in five minutes, so that there is not much time lost.

Mr. STEWART: The same thing can be done with an ordinary joint if you have everything ready.

Mr. MAYER: But you must have the lead and all the attendants on the ground.

Mr. STEWART: We are exactly in the same position with the composition.

Mr. M'GILCHRIST: We are all much indebted to Mr. Mayer for the clear account he has given us of Painter's joint; still I am of opinion that the process he has described is no improvement upon the system we have at present in use in Scotland. I do not see how the first cost of the pipe can be in any way reduced, owing to the small quantity of metal that is saved. That saving is more than eaten up by the amount of time that would be taken, not only in casting the pipe, but in manipulating the core. And then there is one fatal objection I have to the joint, and that is that if it is not properly made at first, there is no means of putting it right afterwards, as can be done with an ordinary lead joint. We all know that when a pipe sinks or gets out of order, it can be made as good as ever by simply recaulking it. I am afraid this never could be done with Painter's joint. Mr. Mayer says it is only unskilled labour that is required to make these joints. So far as I understand, it would require a very skilled person indeed to make them properly.

The PRESIDENT: Though there is a saving of lead by this method, I am of opinion that it would be more expensive than a common lead faucet joint.

Mr. NELSON: I fancy that this joint would have been more successful if Mr. Painter, instead of using lead, had simply used an expansive kind of cement. It is quite common in England, and I am sorry it is not so common here. This cement hardens in about an hour, and in hardening it expands, and expands so thoroughly as to make a perfect joint. By night rust gets into the joint, so that there is no likelihood of it leaking at all—in fact, it becomes an oxidized joint. From the softness of the material used here, I am afraid that, do what you might, gas would permeate it, and by-and-by you would have a leaky joint.

Mr. M'GILCHRIST: Perhaps Mr. Nelson will favour us with the name of the cement that is used in England.

Mr. NELSON: There are four kinds in use. In the North of England all turned and bored joints are fixed up with this cement, and I have not heard of leakages from any of these joints. The only place in Scotland where I know it is used is Hawick.

Mr. DONALDSON: We get it from the North of England. It is simply called cement, but there are three or four kinds. What we use is technically called "Vulcan's cement." I may say it is only one-third the cost of lead.

Mr. BRODIE: I am afraid that cement is only used where the pipes are half turned. Many years ago I made a joint with white lead, and it was first rate, but it was a turned and bored pipe.

Mr. DONALDSON: We have no turned and bored joints in our works—they are all plain castings.

Mr. BRODIE: Seeing the cement does not expand in cooling, it is not likely that a good joint can be made without these boxes.

Mr. NELSON: It is not known in practice, whatever may be the theory.

Mr. MAYER: On this last point I may say that cement made with common plaster of Paris, thoroughly dry and set, will permit gas to pass through—gases will pass through unglazed earthenware, and the lighter they are the more rapidly will they pass through. Mr. Nelson raised the question of casting the pipe with a grooved head. I find that in one of his notes to me, the agent in London says that the inventor has designed a core box in order that no trouble should be experienced in making a sound core; but I think there is no necessity to instruct Scotch founders on this subject. [Mr. Mayer then read one or two testimonials to show that joints made with this material were, even when tested with high presures, perfectly water-tight[.

A vote of thanks was accorded to Mr. Mayer for his paper.

(To be continued.)

A GOLD MEDAL has been awarded at the Sydney Exhibition to Mr. John Spencer, of West Bromwich, for "Iron Tubes and Fittings."

REDUCTION IN THE PRICE OF GAS AT SHIPLEY.—The Shipley Gaslight Company have given notice that all gas consumed on and after the 1st of July will be charged at a reduced price of 3s. per 1000 feet to those who pay within one month from the date of the quarter's account. No deduction from the price of 3s. 4d. per 1000 feet will, however, be allowed on any account not paid within this time.

GAS-ENGINES FOR HYDRAULIC WORK.—A pair of gas-engines of 12-horse power each, of the "Otto" type, have recently been erected at the Windsor Street Gas-Works, Birmingham, which, by means of belts, work a set of three-throw force-pumps which lift a large-sized accumulator, giving off 700 lbs. pressure, intended to be utilized all over the works. This arrangement has been carried out by Messrs. John Abbot and Co., Limited, under the superintendence of Mr. Charles Hunt, who, we believe, is the first Gas Engineer to adopt gas-engines for this class of work.

NORTH SHIELDS WATER-WORKS COMPANY.—The thirty-fourth annual meeting of this Company was held on Monday, the 31st ult.—T. Jackson, Esq., J.P., in the chair. The Secretary (Mr. H. Clarke) presented the Directors report, which stated that since the last annual meeting there had been 103 services laid on to supply 139 new consumers. The gross receipts for the year were £7959 7s., and the expenses, including interest on loans, £5269, leaving a balance of £2690 7s., which, with the sum of £629 10s. 11d.—the balance remaining last year after paying the dividend and other payments—made a total of £3319 17s. 11d. to the credit of profit and loss account. The Directors recommended a dividend of 6 per cent., which would amount to £2400; and after adding to this £97 17s. 5d., his Grace the Duke of Northumberland's 1-7th share, there would remain (after paying these amounts) a balance of £822 0s. 6d. to the credit of the account. The report was adopted, and the meeting closed with a vote of thanks to the Chairman.

LIVERPOOL CORPORATION WATER ACCOUNTS.—The Liverpool City Treasurer (Mr. A. Tweedie) has just issued his account of the Corporation receipts and expenditure for the year 1879, from which we learn that the Water Committee had an income of £188,069, their expenditure being £190,179. The principal items of income are £102,272 for water-rents, £66,095 for water-rate, and £9406 for water supplied to shipping. The first item on the expenditure side is £91,330 paid in interest. A sum of £4465 was disbursed in promotion of the Corporation (Vyrnwy) Water Bill. The extraordinary receipts are set down at £29,127, and the expenditure includes £8941 for the deep boring at Bootle. The ordinary expenses for the past year were greater than ever, being nearly five times what they were in 1848, and nearly twice what they were in 1857. At the same time the ordinary receipts were less in 1879 than in 1878, though the disbursements were more. But in 31¼ years the aggregate ordinary income has exceeded the expenditure by £32,693, the respective figures being £3,864,255 and £3,831,562. There are outstanding mortgages to the amount of £2,299,317.

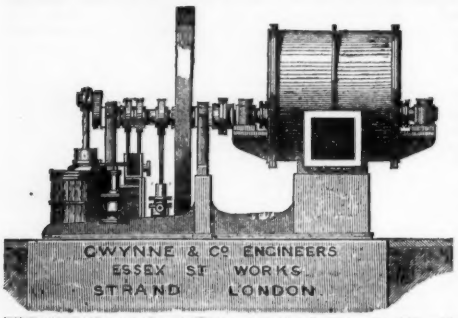
NORWOOD (MIDDLESEX) WATER COMPANY, LIMITED.—The Board of Trade report with respect to their proceedings preparatory to granting a Provisional Order to the above-named Company, which Order forms part of the Confirmation Bill now before Parliament, has just been issued. It states that the application was for authority to the Company to extend their authorized limits of supply into the districts of East Bedfont, Feltham, Cranford, and Hanworth. All the local and road authorities gave their consent to the Order with the exception of the Vestry of Cranford, who asked for a local inquiry. The Board accordingly appointed Major Marindin, R.E., one of their inspecting officers, to hold a public inquiry at Cranford, and to report to them in the matter. He reported that in order to supply the other parishes, containing 4899 inhabitants, it was necessary to lay pipes through the intervening parish of Cranford, which contains 557 inhabitants, and that the promoters did not propose to take powers to supply the parish of Cranford except upon the requisition of the Vestry of 20 householders. As there appears to the Board of Trade to be no valid objection to laying pipes through the parish of Cranford, the interests of which would be protected by the provisions of the Water-Works Clauses Acts, they decided to dispense with the consent of the Vestry, and to empower the promoters of the Order to lay their pipes through the parish for the purpose of carrying water to the other parishes, but without any obligation on the part of the Company to supply the inhabitants of Cranford, except at the request of the Vestry.

THE LIVERPOOL CORPORATION (VYRNWY) WATER SCHEME.—The *Liverpool Mercury* of Thursday last says: "We understand that the Water Committee have come to terms with the Severn Commissioners and the other bodies who have been opposing the Vyrnwy Bill, and that it is now likely the measure will receive parliamentary sanction this session. The exact terms of the compromise have not yet been allowed to transpire, but we hear that the Water Committee are pledged to give compensation to the extent of 10 million gallons per day to the Severn interests, in addition to some 30 or 32 freshets during the summer months. The interests of the Great Western Company are to be compensated by a payment of £25,000. The resolution of the Gloucester Town Council on Tuesday not to further oppose the Bill may be accepted as an indication of the course that will now be taken by Bridgnorth, Shrewsbury, and other towns which have hitherto been in opposition; and should no hitch occur, the Bill will probably pass through Parliament without any more difficulty. In order to give the large quantity of compensation water demanded, it will be necessary to add to the expenditure of the Vyrnwy works by raising the embankment; but this will be a small cost compared with the expense of carrying a contested Bill through the House of Commons. It is estimated that, after giving the 10 million gallons for compensation, the available supply for Liverpool will not be less than 40 million gallons per day. If these terms of compromise are finally acted upon, and we get the promised large supply for Liverpool, the Water Committee will be well out of what at one time threatened to be a very serious difficulty."

PORTISHEAD WATER COMPANY.—The tenth half-yearly general meeting of this Company was held on Saturday, the 29th ult.—Mr. F. Weatherly in the chair. The Secretary (Mr. F. R. Daniel) read the Directors report, which stated that the period of three years since the Company commenced supplying water to the public expired on the 31st of March last, and consequently completed the term during which the works and revenues of the Company were, under agreement, leased to Messrs. Warren and Minns. The Company were now, therefore, in receipt of the actual water-rentals, and bore the cost of working and maintenance, instead of receiving from the lessees a fixed rental free of charges. The leasing arrangement made by the contractors in anticipation of the more rapid development of the district than had occurred had been more financially advantageous to the Shareholders, but the Directors hoped that ultimately the results of direct management would be found generally satisfactory, and give the Shareholders an immediate interest in the extension of the Company's business under the present improving prospects of the district. A dividend at the usual rate of 3 per cent. per annum under the leasing arrangement was recommended. The Chairman, in moving the adoption of the report, said from his knowledge of the district he had a very strong opinion of the future great success of the water undertaking. It had not improved as they could have wished, owing to the delay which had arisen from the misfortune at the docks; but only let that work be carried out with the singleness of purpose which should belong to every undertaking, and he thought the Shareholders would see Portishead a flourishing place of business, and the adjacent hills covered with good residential houses. The report was adopted, and the dividend recommended therein declared. The retiring Directors and Auditors were re-elected, and a vote of thanks to the Chairman closed the proceedings.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

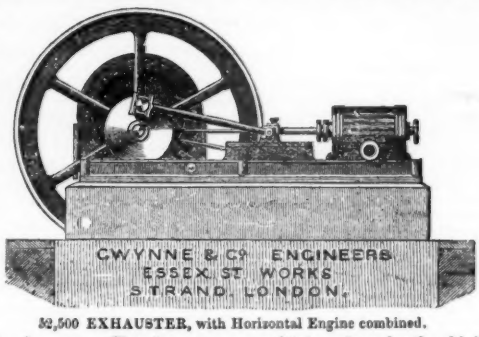
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

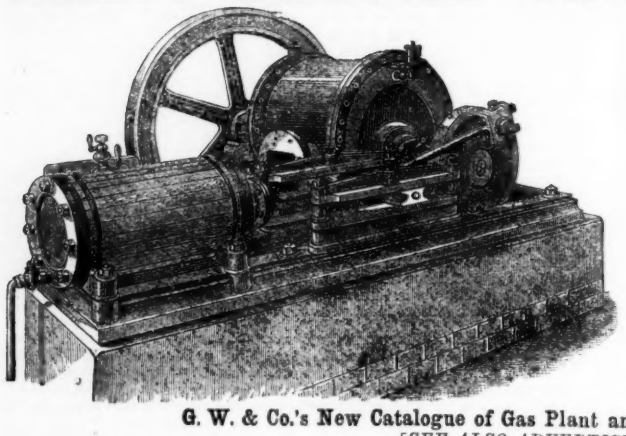
Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.
Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

WITH

Wrought-Iron Spindles and ENGINES COMBINED.



SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.
[*SEE ALSO ADVERTISEMENT, PAGE* 894.]

Phœnix Engineering Works:
HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

AN Engineer is desirous of an Engagement, at Home or Abroad, as ASSISTANT or ENGINEER of a Gas or Water Works. Several years experience in the design and management of both. Good testimonials and references.

Address, in the first instance, to No. 665, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Manager of a Chemical Works, or at a large Gas-Works where Residuals are manufactured. Qualifications: Distillation of Tar, Treatment of Products, making of Sulphate and Liquor Ammonias.

Address "Q. 13," at C. H. May and Co.'s General Advertising Offices, 78, GRACECHURCH STREET, E.C.

BOROUGH OF NEATH, GLAMORGANSHIRE.

THE Town Council of this Borough are prepared to receive APPLICATIONS for the Managership of the Corporation Gas-Works in this Borough. The Manager will be required to discharge all the duties incident to the management and conduct of the Gas-Works, and the keeping of the accounts thereof (with the assistance of one person to act as Clerk and Collector), and to devote the whole of his time to the discharge of such duties in connection with the Works as shall be directed by the Corporation or its Gas Committee. Salary £200 per annum, payable quarterly, with an allowance of coal and gas for private consumption at own residence.

Applications and testimonials (such applications to state when the applicant would be at liberty to enter upon the duties of his office) to be sent, addressed to the Town Council, and endorsed "Application for Gas-Works Managership," under cover to me, on or before the 12th of June, 1880.

By order,
ALFRED CURTIS, Town Clerk.

Neath, May 24, 1880.

WANTED, by the Advertiser, a Young Man aged 25, and Married, a Situation as MANAGER of a small Gas-Works. Applicant has a thorough knowledge of the Manufacture and Distribution of Gas in all its branches. Has had several years experience as Manager of a Works (make 15 millions). Has no objection to go Abroad. Satisfactory reasons for change.

Address No. 663, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the following Second-hand PLANT:—

A SCRUBBER, about 12 ft. high, 3 ft. 6 in. wide; with Water Tank and Distributing Apparatus, and 6-in. Connections and Four-Way Valve.

A PURIFIER, about 9 ft. by 6 ft., and 4 ft. deep, with Sieves, Lift, 6-in. Connection, and Four-Way Valve.

Price, &c., to be addressed to GEO. WHITMAN, Company's Office, Aspley Guise, near WOBURN.

GAS SHARES FOR SALE.—Ten £5 SHARES of the Hawick Gas Company, guaranteed dividend 10 per cent., payable yearly on the 26th of May.

Address offers to No. 666, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PURIFIERS for Sale, Cheap.—Two 8 ft. by 4 ft. by 4 ft., with all Connections and Hydraulic Valves for working either one or both. T-iron Rail and Lifting Screw complete. Or the Covers, which are as good as new, of 10 B. W. Gauge, would be sold separate.

Apply to L. MONK, Manager, Gas-Works, LANARK, N.B.

FOR SALE—A Second-hand Square STATION-METER, to pass 40,000 cubic feet per hour. Erected about 12 years. Made by Messrs. J. and J. Braddock, Oldham. Now in use at the Plymouth Gas-Works. To be removed to make place for a larger sized Meter. To be sold a bargain.

For price and particulars apply to W. W. ANDREWS, 238, Kingsland Road, LONDON.

GAS PLANT FOR SALE.

THE Committee of the Burton-on-Trent Corporation Gas Department have for Sale One Set of TWO PURIFIERS, 24 ft. by 10 ft., 3 ft. 9 in. deep, 12 in. Connections, and Two 12 in. Four-Way Dry Valves by Walker, Lifting Apparatus, &c.

One Set of TWO PURIFIERS, 14 ft. by 14 ft., 3 ft. 9 in. deep, and Six 12-in. diameter Valves by Young, Lifting Apparatus.

The above having been replaced by larger can be removed at once.

Further particulars may be had on application to the undersigned.

JOHN MUDIE, Manager.

Gas-Works, Wetmore Road, June 5, 1880.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—

SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.

CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.

ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.

STATION-METER.—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.

HYDRAULIC MAIN.—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.

BRIDGE AND ASCENSION PIPES.—90 6 in. by 4 in. Bridge-Pipes, and a quantity of 6-in. Ascension-Pipes and Bends.

RETORTS.—31 Rounds, 15 in. diameter and 9½ ft. long, in two pieces. 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.

For further particulars and price apply to

JOHN WEST, Engineer and Manager.

Gas Works, Maidstone, April 21, 1880.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the above-named Company have for Sale about 190 tons of Spent OXIDE OF IRON.

The same may be seen and samples taken upon application to

JAMES WEEKS, Manager.

Gas-Works, Cambridge, May 21, 1880.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

THE Directors of this Company have for Sale the undermentioned PLANT:—

18 Lengths of Hydraulic Main, each 9 ft. long, 18 in. by 15 in. diameter.
Three Lengths of Hydraulic Main, each 10 ft. long, 19 in. by 17 in. diameter.
126 Mouthpieces, with Ascension-Pipes, complete.
One Condenser, formed of 52 9-in. Pipes.
One Scrubber, 20 ft. high, 5 ft. diameter.
One Purifier, 11 ft. 6 in. square.
One „ 14 ft. „
One Travelling Crane for the above.
One Meter to pass 15,000 cubic feet per hour.
One Governor to pass 30,000 „ „
Two 9-in. and eight 12-in. Valves.
Four Wrought Girders, each 44 ft. long by 17 in. by 6½ in.
Two Cast Columns, each 21 ft. long by 13 in. by 10 in.
Two „ „ 14 „ 10 „ 8 „
Two „ „ 11 „ 9 „ 7 „
One „ „ 10 „ 12 „ 10 „

The above may be seen and further particulars obtained of

JAMES WEEKS, Manager.

Gas-Works, Cambridge, May 21, 1880.

GAS PLANT FOR SALE.

THE Coventry Gas Company have for SALE—

SCRUBBERS.—One 5 ft. 6 in. diameter, 15 ft. high. One 5 ft. diameter, 20 ft. high; with or without 8-in. Connections and Valves.

STEAM-JET VENTILATOR.—One No. 2 Körting's Patent Jet Ventilator, with Chest. One No. 3½ Körting's Patent Jet Blower.

VALVES.—Two Cockey's Dry Centre Valves for four Purifiers. One 12-in. Cathels's Four-way Valve.

The above are being replaced by larger apparatus, and can be removed at once. Also a 100-light Gas Apparatus (Porter's make); this includes a Gasholder, 14 ft. diameter and 10 ft. high, which could be sold separately.

For particulars and prices apply to

W. L. ROBINSON, Manager.

Gas-Works, Coventry, April 17, 1880.

THE Sheffield United Gaslight Company OFFER for SALE the following lots of Retort-House FITTINGS, which they are now taking down at two of their Stations:—

54 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 18 in.
16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 15 in.
4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 16 in. by 15 in.
320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
160 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 7 ft. 6 in. long.
215 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 6 in. long.
50 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 5 ft. 6 in. long.
60 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 2 ft. 8 in.
37 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 10 ft. 2 in.
40 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 10 in.
17 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 5 in.
481 Lengths 4-in. Cast-Iron H-Pipes.
506 Lengths 4-in. Cast-Iron Dip-Pipes.

The above apparatus has been in use up to a recent date, and is adapted for re-erection.

The Company will be prepared to receive an offer for the whole or any portion of the above. Price £4 per ton, loaded into trucks at Sheffield.

Applications to be addressed to the undersigned.

THOS. ROBERTS, Manager.

Gas Office, Sheffield, March 25, 1880.

SECOND-HAND ENGINES, EXHAUSTERS, BOILERS, &c.

THE Scarborough Gas Company invite OFFERS for the Purchase of their present Duplicate Exhausting Machinery, comprising Two 7-in. Cylinder by 14-in. Stroke Horizontal Steam-Engines; Two 20,000 cubic feet per hour Gwynne and Beale's Patent Exhausters; Two Hydraulic Governors in Connection with Throttle Valves of Engines; and Two Cornish Boilers, 11 ft. by 3 ft. 9 in.

The whole are of superior make and have been carefully used, and are well worth attention, being about to be removed for replacement by larger and more powerful apparatus.

The machinery may be seen in operation until the 30th of April, and further particulars may be obtained on application to the undersigned.

By order,

WILLIAM J. MOON, Manager.

Scarborough, March 5, 1880.

ILKESTON GAS-WORKS.

CONTRACT No. 2.—PURIFIERS, &c.

THE Ilkeston Local Board are prepared to receive TENDERS for the Work to be done in the Construction and Erection of Four Cast-Iron PURIFIERS with Valve Connections and Travelling Lifting Apparatus for their Gas-Works, Rutland Street, Ilkeston.

Plans and specifications may be seen, and forms of tender and quantities obtained of the Manager at the Works.

Sealed tenders, endorsed "Tender for Purifiers," must be sent to me on or before Friday, June 25, 1880.

The Board do not pledge themselves to accept the lowest or any tender.

By order,

WRIGHT LISSETT, Clerk to the said Board.

Town Hall, Ilkeston, June 5, 1880.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 8 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Corporation are prepared to receive TENDERS for the Purchase of the surplus GAS TAR (about 1500 tons) up to April 30, 1881.

Further information may be obtained on application to Mr. Wm. Carr, Engineer, Gas-Works, Halifax; and tenders, properly endorsed, must be sent to me on or before Thursday, June 24, 1880.

By order,

KEIGHLEY WALTON, Town Clerk.

Town Hall, Halifax, May 28, 1880.

BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Corporation are prepared to receive TENDERS for the Purchase of the whole of the AMMONIACAL LIQUOR manufactured on their premises for a period of Two, Three, or Four years. The Liquor to be delivered either into railway tanks or canal barges as the Contractor may desire.

Further particulars and forms of tenders may be obtained on application to Mr. Wm. Carr, Engineer, Gas-Works, Halifax, and tenders, properly endorsed, must be sent to me on or before Thursday, June 24, 1880.

By order,

KEIGHLEY WALTON, Town Clerk.

Town Hall, Halifax, May 28, 1880.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Coventry Gas Company are ready to receive TENDERS for the Purchase of the Surplus TAR produced at their Works.

Tenders to state price per ton of 20 cwt. delivered into boats at Coventry for One, Two, or Three years from July 1, 1880. Weight to be taken over the Gas Companies weigh-bridge at the Gas-Works.

Present annual quantity, 800 tons.

Tenders to be delivered not later than the 14th of June, addressed to the CHAIRMAN.

TO GASHOLDER MAKERS.

THE Directors of the Kirkham (Lancashire) Gas Company are prepared to receive TENDERS for the Erection of a GASHOLDER, 50 ft. diameter by 18 ft. deep.

Plans and specifications may be seen on application to Mr. Green, Gas Engineer, Preston.

Sealed tenders, addressed to the Chairman of the Company, and endorsed "Tender for Gasholder," must be delivered on or before Monday, the 21st of June next.

The Directors do not bind themselves to accept the lowest or any tender.

BENJAMIN STUTTARD, Secretary.

SOUTH DUBLIN UNION.

TO GAS ENGINEERS AND OTHERS.

THE Guardians of the above Union invite PLANS and TENDERS from competent persons for the CONSTRUCTION of GAS-WORKS on the Workhouse premises for the Supply of Gas to the Workhouse.

Information as to the site of the proposed Works, the annual consumption of Gas, and all other particulars, can be had on application to the Master of the Workhouse.

Sealed tenders, accompanied by plans, to be left with me here, not later than 11 o'clock a.m., on Thursday, the 17th of June, on which day they will be opened by the Board.

The Guardians do not bind themselves to accept the lowest or any other tender.

By order,

ARTHUR PERCY STOKES, Clerk of the Union.

Board Room, James's Street, Dublin,
May 29, 1880.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the Purchase of the whole or a portion of the GAS TAR to be produced at their Gaythorn and Rochdale Road Works during a period of Three or more years, commencing on the 1st day of March, 1881.

Sealed tenders, addressed to the Chairman of the Gas Committee, Town Hall, Manchester, and endorsed "Tender for Gas Tar," must be delivered here on or before Wednesday, the 16th day of June next.

The Committee do not bind themselves to accept the highest or any tender.

Further particulars and forms of tender may be obtained on application to Mr. Geo. B. Jackson, at the Gas Office.

By order,

JOS. HERON, Town Clerk.

Town Hall, Manchester, May 15, 1880.

THE MALTA & MEDITERRANEAN GAS COMPANY, LIMITED.

NOTICE is hereby given that the ORDINARY GENERAL MEETING of the SHAREHOLDERS of this Company will be held at the Offices, 60, Gracechurch Street, London, E.C., on TUESDAY, the 22nd of June, at Twelve o'clock at noon, for the purpose of receiving the Report of the Directors and the Accounts for the year ending the 31st of March, 1880; and the transaction of the general business of the Company.

One of the Directors, Mr. Samuel Andrews, will retire from office, but is eligible for re-election.

The Auditors, Mr. James Le Geyt Daniell and Mr. Alfred Hersee, will retire from office, but are eligible for re-election.

The Transfer Books will be closed from the 16th until the 29th of June.

By order of the Board,

F. A. DUFFIELD, Secretary.

60, Gracechurch Street, May 25, 1880.

BIRMINGHAM CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Birmingham are prepared to receive TENDERS for the Purchase of AMMONIACAL LIQUOR produced at their Windsor Street Works during a period of Seven years, from September, 1881.

The present annual production is 2,600,000 gallons.

Forms of tender may be obtained on application to

EDWIN SMITH, Secretary.

Offices of the Department, Old Square, Birmingham.

BOLTON CORPORATION—GAS DEPARTMENT.

CONTRACTS FOR COAL AND CANNEL.

THE Gas and Lighting Committee are desirous of receiving TENDERS for CANNEL and Best Screened GAS COAL for One, Two, or Three years, commencing the 1st of July next, to be delivered free at the Bullfield or Craddock Lane sidings of the Lancashire and Yorkshire Railway, at Bolton; or, if carted, at the Gas Street or Lum Street Works, as may be required.

Sealed tenders, endorsed "Tender for Coal," specifying the description of Cannel or Coal, the pits at which they are to be raised, and the quantities proposed to be supplied, to be sent to the undersigned on or before Wednesday, the 16th of June next; stating also cash terms for monthly payments.

The Committee do not bind themselves to accept the lowest or any tender, but the person or persons whose tender may be accepted will be required to execute an agreement for the due performance thereof.

By order,

R. G. HINNELL, Town Clerk.

Gas Offices, Bolton, May 28, 1880.

THE LLANDUDNO IMPROVEMENT ACTS, 1854 and 1876.

TENDERS FOR GAS COAL.

THE Llandudno Improvement Commissioners invite TENDERS for the Supply of GAS COALS. The tenders to be for One, Two, or Three years, as the Commissioners may determine. To be delivered in such quantities and at such periods as may be required.

The quantity required is estimated at about 1500 tons per annum.

Parties tendering to give separate prices for Cannel Coal, Best Gas Coal, and Gas Coal and Cannel mixture, delivered, carriage paid, at the London and North-Western Railway Station, Llandudno.

Sealed tenders, endorsed "Tender for Gas Coal," to be delivered to the undersigned not later than by the morning postal delivery of Saturday, June 19 inst.

The Commissioners do not bind themselves to accept the lowest or any tender.

T. T. MARKS, C.E.,
Engineer and Clerk to the Commissioners.

June 5, 1880.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

BOX'S PATENT STREET GAS-LAMP

Has the following good qualities:—

1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee,

W. W. BOX,

Gas-Works, Crayford, Kent.

Imperial
METER COMPY.,
LIMITED,
Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.
KING'S ROAD, ST. PANCRAS.
Formerly also (**Walter Ford**) at Gray's Inn Road.

IMPORTANT to GAS COMPANIES.
ENORMOUS SAVING.
JOHN ABBOT & CO., LIMITED,
OF SUFFOLK LANE, LONDON, AND GATESHEAD,
Manufacture and Erect
HYDRAULIC CRANES
For Discharging Coal Barges;
WAGGON HOISTS
For Lifting Coals to Retort-House Stageway;
CAPSTANS
For Moving Trucks about the Yard,
And Apparatus for Lifting PURIFIER COVERS.
Examples to be seen at Beckton, Hull, &c., &c.

COVENTRY GAS COMPANY.
CORN EXCHANGE, COVENTRY.
THREE DAYS ONLY—JUNE 7, 8, & 9.
EXHIBITION OF GAS COOKING AND HEATING STOVES,
GAS-ENGINES, BURNERS,
And other Appliances and Inventions, showing the Advantages and Economical Use of Gas for Domestic and Manufacturing Purposes.
HOURS, 10 A.M. TILL 9.30 P.M.
Admission till 5 p.m., Sixpence; after 5 p.m., Threepence

HARPER & MOORES,
PROPRIETORS OF THE
BEST STOURBRIDGE CLAYS,
STOURBRIDGE.
Manufacturers of all Descriptions of
BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS
Of all Dimensions for Gas-Works,
GLASS-HOUSE POTS & CRUCIBLES
ESTABLISHED 1836.
The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

MR. FREDK. COLYER, M. Inst. C.E., informs his clients and friends his Offices are now at 18, GREAT GEORGE ST., WESTMINSTER, S.W., where he may be consulted upon any matter relating to Gas or Water Works.

GEORGE E. TOURNAY,
CONTRACTOR FOR THE ERECTION AND REBUILDING OF RETORT-BENCHES, CHIMNEY SHAFTS, &c.
RETORT SETTING A SPÉCIALITÉ.
References to large and small Works.
ADDRESS: WINCHEAP, CANTERBURY.

JOHN HALL AND CO., STOURBRIDGE,
Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

Now ready, Second Edition, price 7s., by post 7s. 3d., the
GAS MANAGER'S HANDBOOK.
By THOMAS NEWBIGGING, M.I.C.E.
Orders to be sent to
WALTER KING,
11, BOLT COURT, FLEET STREET, LONDON, E.C.

WARNER'S RETORT-HOUSE MACHINERY.
[*As Illustrated and Described in the* JOURNAL *for May* 4.]
Communications to be addressed to
W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

THE FARNLEY IRON COMPANY, LIMITED,
FARNLEY, near LEEDS,
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS & FIRE-BRICKS,
Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.
In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.
London Agent for Gas-Retorts: D. W. OGG, 3, Jeffrey's Square, St. Mary's Axe, E.C.
" " Glazed Bricks: A. BARFIELD, 22, Great George Street, Westminster.

MECHANICAL CONDENSATION.
The undersigned has arranged with Messrs. Pelouze and Audouin the exclusive agency for their patented system of Condensation, in Great Britain and the Colonies.
The following are some of the advantages which this philosophic mode of arresting liquefiable vapours possesses:—
1. It acts irrespective of temperature.
2. It requires no motive power, but automatically adapts itself to production.
3. It may be fixed directly after the hydraulic main, by which prolonged contact of the gas with tar is avoided, and the highest standard of illuminating power is obtained which the coal is capable of giving; or it may be fixed directly after an ordinary air condenser, when it will arrest the vapoury globules which cooling alone will not stop, and the production of tar and ammonia water is thereby increased.
4. It effects a considerable saving in purification, through no tar getting to the material to clog its action.
5. It entirely supersedes the necessity of scrubbers; and if wet sawdust be used in a purifier, washers also are unnecessary.
6. It occupies but little space, and avoids that which is now considered a disadvantage—the too much cooling, scrubbing, and washing of gas.
Further particulars may be obtained of
GEO. BOWER, St. Neots, Hunts.

NOTE.—*Gas-works contracted for complete, or apparatus supplied in detail from the retort to the burner.* "*The Gas and Water Engineer's Book of Reference,*" *post free,* 5*s.* "*Handy Abstract of the Public Health Act,* 1875," *post free,* 1*s.*

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

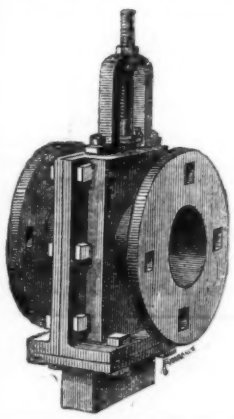
EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.



IMPROVED

BRIDGE VALVES

For Regulating the Seal of Hydraulic Mains in Gas-Works.

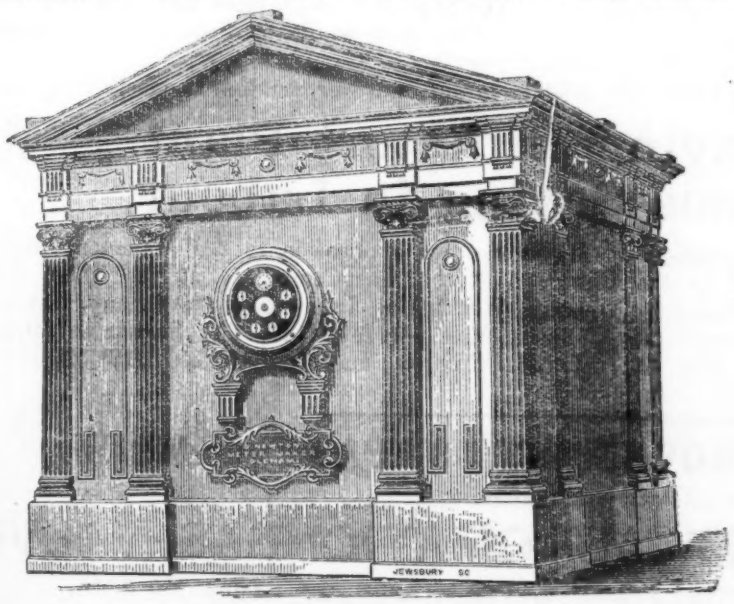
These Valves are so arranged that, when once adjusted for the proper overflow, they can be closed entirely and *opened* again without altering the adjustment.

B. DONKIN & Co.,

BERMONDSEY, LONDON, S.E.

GEORGE NEWTON,

UNION STREET WEST, OLDHAM,



MANUFACTURER OF

SQUARE STATION-METERS, with PLANED JOINTS;

ROUND STATION-METERS, WITH CAST-IRON STANDS;

WET AND DRY CONSUMERS GAS-METERS, GOVERNORS, &c.

WOOD TROUGHING

For Preserving Service-Pipes.

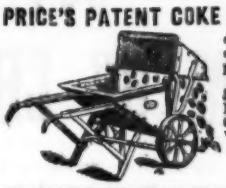
Price from Three-Farthings per Foot.

In any Lengths.

THOS. PROUD,

Brookfield Works, Icknield St., Birmingham.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. Face, Inventor and Patentee, Gas-Works, Hampton Wick, Middlesex.

Prices are Reduced.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

Depôt for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

OXIDE OF IRON.

Gas Companies can be supplied with any quantity of Natural Oxide suitable for Gas Purification purposes. Shipped direct from the extensive estates in Co. Donegal of the Earl of Leitrim and Wybrants Olphert, Esq., D.L.

By thus purchasing from the producer a constant supply of the purest material will be ensured to the Gas-Works, and intermediate profits will be saved to the Shareholders.

For terms, references, and particulars apply to

JOHN BEATTIE,

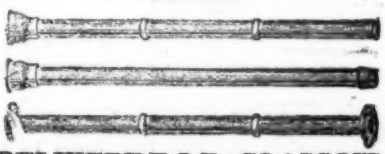
Falcaragh, Co. Donegal, Ireland.

GAS AND WATER PIPES.

WILLIAM MACLEOD & Co.,

70, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application.

CAN THE HYDRAULIC MAIN BE ABOLISHED?

YES, very easily, by using

WHITE'S AUTOMATIC GAS-VALVE.

HERE'S PROOF:—

Gas-Works, Aberystwith, Jan. 24, 1880.

Mr. Wm. White, Abersychan, Mon.

Dear Sir,—The retorts fitted with your Valves answer very well. Our average make is 5600 cubic feet per mouthpiece, and we have no difficulty in producing 16-Candle Gas without any Cannel; although we formerly (with the old hydraulic dip-pipes) used a percentage to obtain that candle power. During the whole time they have been at work we have not been troubled with a choked ascension-pipe.

Yours respectfully,

J. Dougall, Engineer.

Mold Gas and Water Company's Works, Mold, May 28, 1880.

Mr. W. White, Gas Engineer, Abersychan.

Dear Sir,—After two years experience of your "Patent Automatic Gas Valve," which I consider a fair trial, I come to the following conclusions:—

1. That they are perfectly reliable as a complete seal.
2. An almost utter absence of back pressure.
3. Great freedom from deposit of carbon, some retorts not having been scurfed since adoption of valves.
4. They require no attention whatever, as we have not touched them since putting up.
5. The economy of your system is so great, and the evils it removes so many, that I would not return to the antiquated "dip" upon any consideration, and strongly recommend your method to the gas world.

Yours respectfully,

E. Owen, Engineer.

Note.—Other testimony to follow. Illustrated pamphlet descriptive of the system sent post free for 6½d. in stamps, on application to the Inventor and Patentee as above.

IMPROVED GAS-MAKING.

WEST'S PATENTED

SYSTEM OF CHARGING & DRAWING RETORTS

Has been in operation with complete success at the Gas-Works of Maidstone, Richmond, Ipswich, Portsea, Tunbridge Wells, and at the Rochdale Road Station of the Manchester Corporation Gas-Works (for a production of upwards of Two Millions per day); also at the South Metropolitan Works, in a new house erected for nearly the same make per day; and it will very shortly be in use at Burnley, while its adoption at an early period at other London and large Provincial Gas-Works is under consideration.

Four Companies, after thoroughly testing the merits of the System, have given orders for Second Sets of Machines, in order to work a greater number of Retorts on West's System.

The advantages of the System are absolutely established.

THE COMPARATIVE TRIAL AT MANCHESTER OF WEST'S AND FOULIS'S SYSTEMS OF DRAWING AND CHARGING RETORTS.

(See the JOURNAL OF GAS LIGHTING of March 23, 1880.)

	GAS MADE.				CANNEL AND COAL CARBONIZED.				WAGES ACCOUNT.	SUMMARY OF EXPENDITURE PER 1000 FEET.			
	Make per House.	Illuminating Power.	Make per Ton.	Make per Mouthpiece, 24 Hours.	Quantity.	Percentage of Cannel.	Average Cost per Ton.	Average Cost per 1000 Feet.	Cost per 1000 Cubic Feet.	Cannel and Coal.	Wages Account.	Interest, Depreciation, and Wear and Tear.	Total Expenditure per 1000 Feet.
	Cubic Feet.	Candles.	Cubic Feet.	Cub. Feet.	Tons. Cwt.		s. d.	s. d.	d.	s. d.	d.	d.	s. d.
FOULIS .	9,105,716	18·05	10,266	6695·4	886 18	66·75	12 9·6	1 2·97	Wages, 2·905 *Ponies, 0·105 3·01	1 2·97	3·01	0·383	1 6·36
WEST . .	10,738,200	18·19	11,709·5	8948·5	917 1	68·45	12 11·2	1 1·25	1·68	1 1·25	1·68	0·236	1 3·16

* The ponies are used to draw the scoops to the machines in Foulis's system.

Note.—The above account for wages includes all charges (after the coals are tipped from the railway waggon into the stores) to the quenching and tipping of the coke in the yard, which in both cases had to be wheeled a long distance.

At Maidstone, under ordinary and easy conditions of working during many months past, the average production per ton has been 11,054 cubic feet from Newcastle coal, which, under good working, on the old system yields 9500 to 10,000 cubic feet. The illuminating power has been nearly 15 candles, very small percentages of Cannel being used now and then. The yield per mouthpiece has been over 8000 cubic feet per 24 hours, with 50 per cent. reduction in labour cost, while the fuel account compares favourably with that of large well-managed Companies.

The merits of the System are numerous; the most important, however, are that it effects

A Great Saving in Retort Plant.
An Enormous Saving in Labour.

The System can be seen in operation at Maidstone, on application to the Manager; also at Manchester, on application addressed to the Chairman of the Gas Committee at the Town Hall. Inquiries may be addressed to the Managing Director, West's Gas Improvement Company, Limited, Maidstone; to the Consulting Engineer, R. P. Spice, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W.; or to F. W. Hartley, Esq., A. Inst. C.E., Engineer and Analyst, 55, Millbank Street, London, S.W.

WEST'S GAS IMPROVEMENT COMPANY, LIMITED,

ARE ALSO THE SOLE MANUFACTURERS OF

WHITE'S PATENT AUTOMATIC GAS-VALVE,

THE ONLY PERFECT SELF-ACTING SUBSTITUTE FOR THE DIP AND HYDRAULIC MAIN.

NEARLY 1300 VALVES IN USE.

A Descriptive Pamphlet, with Testimonials, will be sent free on application to the above Company, or to the Patentee, Mr. William White, Gas-Works, Abersychan, Mon.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

J. E. WILLIAMS & CO.,

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists.

HONOURABLE MENTION.

PARIS EXHIBITION, 1878.

It has the following qualifications and properties:—

Effectually prevents and arrests corrosion.
Has a fine gloss, and is very durable.
Does not require driers like other paints.
Protects iron from action of water.

Is not affected by sulphuretted hydrogen.
Forms a very hard, tough (not brittle) surface.
Will not crack, blister, or scale.
Is not affected by extremes of temperature.

Covers nearly double the area of other paints. (7 gallons or 1 cwt. will cover 1211 square yards of ironwork.)
Is cheaper and more economical than any other.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS in ACTION AND *out* OF ACTION.

Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

THE

LANCASHIRE GAS-METER COMPANY, LIMITED,

FALCON STREET, ASHTON ROAD,

OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,
LAMP GOVERNORS & TAPS, PRESSURE-GAUGES, MAIN THERMOMETERS,
ETC., ETC.

LIVESEY FIRE-CLAY WORKS.

NEAR BLACKBURN, LANCASHIRE.
(ESTABLISHED 1835.)

ORLANDO BROTHERS, LIMITED,

MANUFACTURERS OF PATENT CLAY RETORTS,
AND EVERY DESCRIPTION OF
TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.
FIRE-BRICKS, TILES BLOCKS, AND CHIMNEY-TOPS.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS,
ROTHERHAM;
AND 85, SOUTHWARK ST., LONDON, S.E.

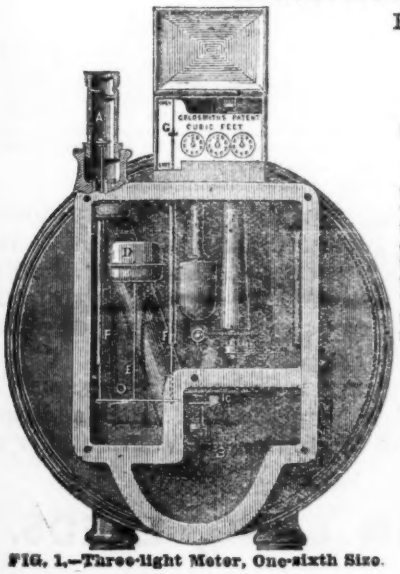


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

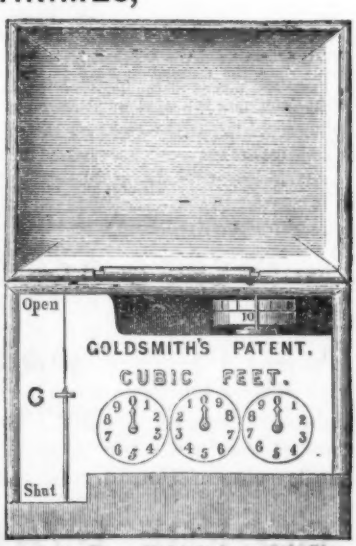


FIG. 2.—Three-light Index, Half Size.

BRAY'S
PATENT LANTERN AND FLAT-FLAME BURNERS.

80-CANDLE POWER LANTERN.

The understated declaration with which we introduced our apparatus has been fully borne out by general experience—namely, that

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

BIRMINGHAM LAMP TESTS

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candle power Lanterns of medium lighting power are immediately required.

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for the sake of general efficiency. The tests further showed that our 80-candle HIGHEST *lighting power burner yielded 3·51 candles per foot of gas (the quality being 16·75—3·35 per foot—by the standard), which was a higher result than that yielded by any other flat-flame burner, and higher than the 80-candle power Argands.*

NOTE.—The above is the most conclusive answer to certain misleading statements which are being made by the most prominent of the defeated competitors.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

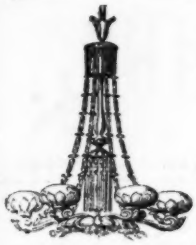
Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[**The above Lamps have Meters attached.**]

NOTE.—Mr. Sugg having freely advertised that among other places where his "burner and lantern have been adopted" is "Leeds," we have to state that, instead of having been adopted there, they have been discarded and returned to that gentleman months ago; nor is there one of his lanterns in the whole borough!

Bray's Lanterns have been adopted by the Vestry of St. George (which includes "WESTMINSTER"), Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting; and also by about 40 Towns and Vestries, after a similar competition in most cases.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

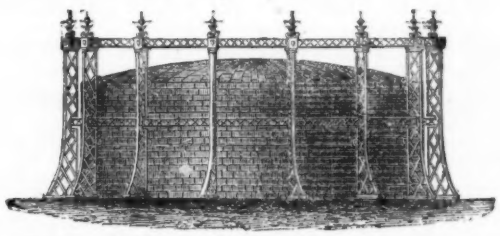
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

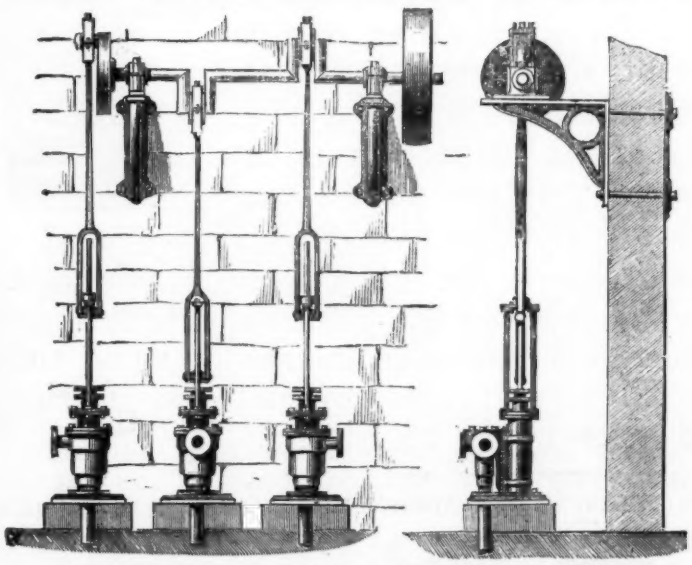
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.
For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

GAS EXPLOSIONS.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

SCOTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

MEMORANDUM FOR GAS COMPANIES.

TORBAY AND DART PAINT COMPANY, LIMITED,

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S TORBAY PAINTS.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

WORKS:

DARTMOUTH AND BRIXHAM, DEVON.

TRADE MARK

These celebrated Paints are now very generally acknowledged to be the best and most economical in use. GAS COMPANIES especially have, by experience, proved that no others so fully meet their peculiar requirements, as they are not only UNAFFECTED BY GREAT HEAT and EFFECTUALLY RESIST SULPHURETTED HYDROGEN, AMMONIA, &c., &c., but they may be applied to GASHOLDERS that have hitherto been covered with the unsightly coal tar.

They are also cheaper than other paints and compositions; TWO COATS OF GENUINE WOLSTON'S TORBAY PAINT BEING EQUAL IN COVERING POWER TO THREE OF LEAD PAINT, or any of the numerous low-priced spurious oxides that are now in the market, whilst the durability of Wolston's is unrivalled.

The colours most approved for GASHOLDERS, PURIFIERS, SCRUBBERS, and all the plant and machinery used in and about Gas-Works, are—

FOR DARK TINTS.

No.	p. Cwt.	No.	p. Cwt.
13. Torbay Red	34s.	8. Bronze Green	36s.
6. Dart Brown	34s.	16. Torbay Chocolate	34s.
10. Carriage Red	34s.	4. Brixham Black	32s.
1. Torbay Brown	30s.		

FOR LIGHT TINTS.

No.	p. Cwt.	No.	p. Cwt.
7. Imperial Stone	34s.	19. Light Stone	36s.
29. Portland Stone	38s.	30. Bath Stone	38s.
31. Gray Stone	38s.	38. Buff	35s.

These Prices are for Paints in paste, carriage paid to any Gas-Works in Great Britain, in consignments of not less than 5 cwt.; but all the above colours may be had, READY MIXED FOR THE BRUSH, IN VARIOUS SIZED PAINT CANS WITH HANDLES, AT A UNIFORM PRICE OF 56s. PER CWT. (6d. PER LB.) carriage paid as above, in consignments of not less than 2 cwt., the sizes being 3 lb., 7 lb., 14 lb., and 28 lb. By taking the Paints in this convenient form, a considerable saving is effected in time, &c., as they can be immediately applied by any workman without the intervention of skilled painters to mix and prepare them; besides which all waste is avoided, and they may always be relied on as containing no adulterating or inferior material.

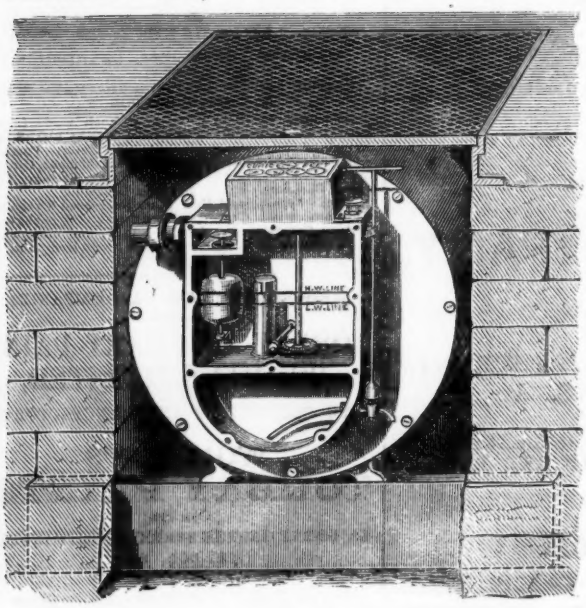
Where light colours are preferred, the work should be primed with two coats of No. 7, and finished with either of the other stone colours; and when the darker colours are selected, a priming coat of No. 13 is recommended.

Specimen Cards forwarded and Inquiries attended to on application to

23, GREAT GEORGE STREET, WESTMINSTER, LONDON.

IMPROVED STREET LIGHTING.

The necessity for having large sized Gas-Lights at street crossings and other open spaces is now generally recognized. To facilitate terms for their use between Gas Companies and Lighting Authorities, we have devised a simple meter arrangement as shown.



The index faces upwards.

The inlet at side and outlet at back may be altered as desired.

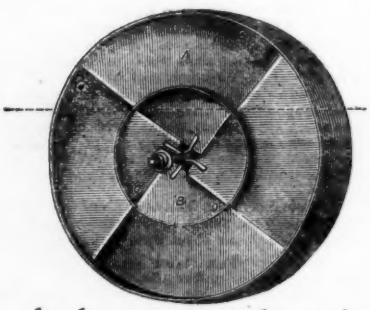
The rod with handle opens and closes the overflow tap.

The Meter case is of cast iron, and it is desirable to place it on a support 6 in. or 8 in. from bottom of tank, that it may be free from the effects of damp.

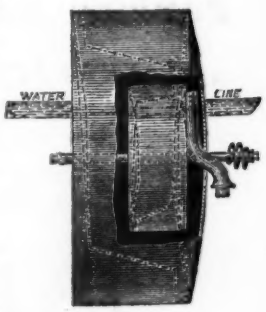
In frosty weather a little glycerine mixed with the water prevents freezing.

The Meter is fitted with

WARNER & COWAN'S
PATENT SELF-REGULATING DRUM,



which ensures correctness of registration within the water-lines shown on the illustration, while its long range of float prevents the valve being closed by vibration from traffic.



Frequent inspection is unnecessary, as the Meter need only be watered at intervals of nine to twelve months.

Dry Meters are unsuitable — the condensation which takes place inside Meters in so exposed a position interfering with their working. Our arrangement has been in use for some time in several of the London parishes, and gives complete satisfaction.

They are made in all sizes up to 20 Lights.

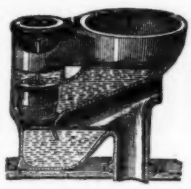
PRICES AND DIMENSIONS ON APPLICATION TO

W. & B. COWAN,

(ESTABLISHED 1827),

DRY & WET GAS-METER MANUFACTURERS,

CHURCH ST., MILLBANK ST., LONDON, S.W. | DUTTON ST., NEW BRIDGE ST., MANCHESTER. | BUCCLEUCH ST. WORKS, EDINBURGH.



SMEATON'S TRAPLESS CLOSETS.

MESSRS. W. SMEATON & SONS,
HOT WATER AND SANITARY ENGINEERS.

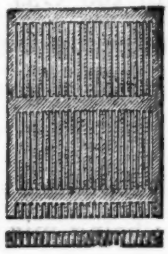
PATENTEES AND INVENTORS OF THE
TRAPLESS, THE D TRAP, AND EDDYSTONE CLOSETS.
Also the New
ECLIPSE COMBINATION CAST LEAD TRAP.

The Price will be half of the old-fashioned D Trap, it being cast all in lead, without a Joint.
Send at once for an Illustrated Price List to their Wholesale and Retail Agent,

G. R. GLENIE,
WALBROOK HOUSE, 37, WALBROOK, LONDON, E.C.

A large Discount to the Trade and Shippers. Estimates Given and Contracts Taken.

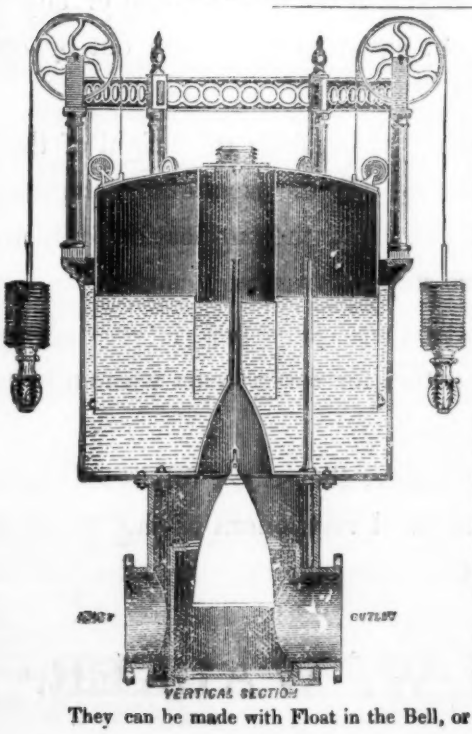
R. DEMPSTER AND SON'S
WOOD SIEVES FOR PURIFIERS,



WITH TAPER OR PARALLEL BARS,
MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
ROSE MOUNT IRON-WORKS,
ELLAND, NEAR HALIFAX.
LONDON OFFICES: 2, SUFFOLK LANE, CANNON STREET, E.C.

J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
ROUND STATION-METERS,
ON CAST-IRON STANDS;
SQUARE STATION-METERS,
WITH PLANED JOINTS.

Messrs. BRADDOCK beg to submit to Gas Engineers their
PATENT COMPENSATING GAS GOVERNOR,
Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,
Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

MOBBERLEY & PERRY,
FIRE CLAY and BRICK WORKS,
STOURBRIDGE.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF
THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.
PROVIDENCE WORKS,
92, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

The Dunston Engine Works Co.,
GATESHEAD-UPON-TYNE.
Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

GEORGE'S
Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.
MANUFACTURERS:
J. F. FARWIG & CO.,
36, QUEEN STREET, CANNON ST., LONDON.

Gold Medal Awarded, Paris Exhibition, 1878.
THOMAS TURTON AND SONS,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS,
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

THE

MANN & WALKERS' PATENT SCRUBBER.

The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Extensive use.

By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Small quantity of Water required.

The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Residual Product obtained.

The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Illuminating power increased.

The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Small amount of power required.

There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Beckton Gas-Works.

There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Reserve purifying power contained.

The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Internal Materials not changed.

They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

Guarantee.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

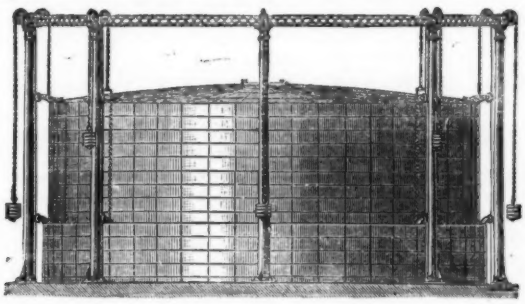
WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.



J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

IRONFOUNDERS AND CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

W. PARKINSON & CO.,

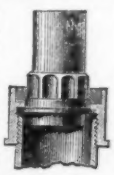
SOLE AGENTS FOR AND MANUFACTURERS OF

FOULGER'S PATENT SEAL UNIONS,

As Supplied to The Gaslight and Coke, Commercial, South Metropolitan, and other Companies.

These Unions practically place a Gas Company's property under lock and key, by rendering it impossible to disconnect at any joint at which gas can be obtained unregistered, without destroying the Company's Seal.

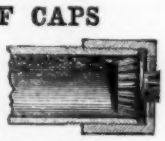
In fixing the Union (one being required on the main cock and another on the inlet only), some molten sealing-wax is poured into the recess on cap, and whilst hot impressed with Foulger's patent tong-shaped die, having the Gas Company's title engraved thereon; the wax being forced into the flutings on the lining, instant destruction of the Seal accompanies any attempt at disconnection.



SECTION.

FOULGER'S PATENT SEAL CUTTING-OFF CAPS

Cannot be taken off without destroying the Company's Seal. A tapered fluted plug (having been white-leaded or puttied) is inserted in the service-pipe. The cap (already filled with sealing-wax) is then screwed over, and tightens on a washer on the flange of plug. The wax is then warmed, and stamped with the engraved die. Absolute security against fraud and escape is thus obtained.



SECTION.

A great advantage will also be recognized in stopping the gas instantly with the plug, and consequent immunity from the present source of danger occasioned by escape during fitting the ordinary cap, frequently in a confined position, and often occupying a considerable time.

Small additional cost over existing connections.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

SANDELL AND SON having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

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GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

RETORT BOLTS,

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BOLTS AND NUTS,

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JOHN STANSFELD,

Bolt & Nut Manufacturer,

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CANNEL COAL MERCHANT,

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SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

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12,580 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND Co., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67-*candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON. London Agent: Mr. F. J LEE SMITH, 38 THROGMORTON ST.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

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GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES.

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

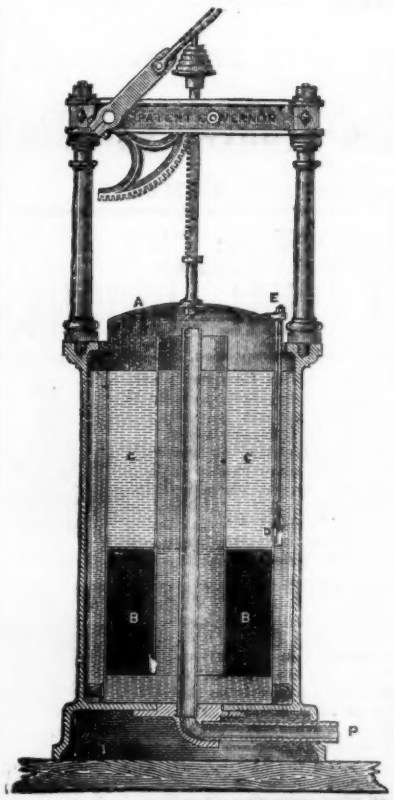
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at
BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
NEWCASTLE-ON-TYNE,
RAMSGATE,
SUTTON,
and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 882.

PHŒNIX ENGINEERING WORKS,
Holland Street and Bear Gardens, Southwark, S.E.

ALDWARKE MAIN AND CAR HOUSE COLLIERIES,

Near ROTHERHAM.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD.

PROPRIETORS.

The Aldwarke Main Brights is a first-class gas-making and coking Coal, yielding by analysis 12,600 feet of 19-candle gas per ton, and giving "Weight of illuminating matter in lbs. of sperm, 820·80." It is very free from impurities and foreign matter.

Copies of Analyses made by Gas Companies who have used it will be forwarded and Samples sent on application.

THE LOCHORE & CAPLEDRAE CANNEL COAL COMPANY,

Limited,

Beg to intimate that the development of their Mines is progressing favourably, and that they are now in a position to supply their famous Cannels.

Quotations and full Analyses will be supplied on application addressed to the Company,

LOCHGELLY, FIFESHIRE, N.B.

Abstract of Analyses made by Dr. WALLACE, Gas Analyst for the City of Glasgow.

	Cubic Feet per Ton.		Illuminating Power.		Equivalent of a Ton in Sperm.
Plesio Boghead	13,165	....	36·16	....	1632
Brown Capledrae	12,210	....	38·46	....	1610

MESSRS. FLETCHER, BURROWS, & CO.,

ATHERTON COLLIERIES, near MANCHESTER,

ARE PREPARED TO MAKE CONTRACTS FOR THE SUPPLY OF

CANNEL AND OF THEIR ARLEY MINE GAS COAL,

WHICH ARE OF ACKNOWLEDGED EXCELLENCE.

Their Coal is in use in the Salford, Stafford, Bolton, and other large Gas-Works in England, Ireland, Wales, and Abroad, giving in practical working 10,300 feet of 17-candle Gas, and 15 cwt. of superior Coke per Ton of Coal.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

REAL OLD SILKSTONE GAS COAL.

C. A. HAWORTH & COY.,

STANHOPE SILKSTONE COLLIERIES,

SILKSTONE, NEAR BARNSLEY,

Are prepared to supply their celebrated **Real** Old Silkstone Gas Coal and Nuts. Prices quoted to any Railway Station, or f.o.b., Hull, Goole, Keadby, Grimsby, Liverpool, and Fleetwood. Every information given on application to above address, or to their Agent,

ALBERT USHER, 5 Office, Finsbury Park, London, N.

THE BLAINSCOUGH HALL COLLIERY COMPANY.

BEST WIGAN ARLEY GAS COAL.

Yielding (as per analysis) 11,970 cubic feet of 16·39 candle gas per ton. Copies of analyses and testimonials from **Gas Companies and Managers**, who have used the Coal in large quantities for several years, will be forwarded on application.

Postal address, **CHORLEY**, Lancashire.

Waggon address, **COPPULL SIDING**, near **WIGAN**, London and North-Western Railway.

SAMPLE QUANTITIES SENT ON APPLICATION.

NEW PATENT WET GAS-METER,

THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

SOLE AGENT FOR SCOTLAND: JAMES KEITH, EDINBURGH AND ARBROATH.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,
238, KINGSLAND ROAD, LONDON.

ALEXANDER WRIGHT & CO.

WET & DRY GAS METERS.

STATION METERS AND GOVERNORS.

JONES'S THROTTLE-VALVE GOVERNORS.

JONES'S DISTRICT GOVERNOR,

The simplest and best Instrument extant for checking Excess of Pressure in hilly districts.

GAUGES AND TESTING APPARATUS OF ALL KINDS FOR GAS.

55, 55a, & 56, MILLBANK STREET, LONDON, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW.

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges, Governors, Test Holders, &c., &c.

LONDON OFFICE:

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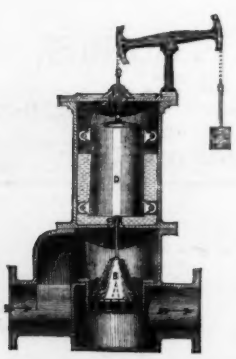
PEEBLES'S

PATENT GAS GOVERNORS,

FOR

Stations, Districts, Public Lamps, & Dwelling-Houses,

Are meeting with increasing favour, and giving full satisfaction where they are in use.



Patent Safety Station-Governor.

Wet and Dry Gas-Meters of Superior Excellence, Station-Meters, &c.

Prices and Illustrations Post Free on Application.

D. BRUCE PEEBLES & CO.,
TAY WORKS, BONNINGTON, EDINBURGH.

London: Printed by WALTER KING (at the office of Clayton & Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 8, 1880.

SUPPLEMENT
TO THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XXXV. LONDON, JUNE 8, 1880. No. 891.

BRITISH ASSOCIATION OF GAS MANAGERS.

SEVENTEENTH ANNUAL MEETING.

INAUGURAL ADDRESS OF THE ACTING PRESIDENT, CHARLES HUNT, ESQ., OF BIRMINGHAM,

DELIVERED TUESDAY, JUNE 8, 1880.

Gentlemen,—The circumstances under which I have to ask for more than the usual measure of that indulgence and support which have been so freely accorded to every former occupier of this chair, are fully known to you. It has unfortunately happened that the President of your choice has been compelled by persistent ill-health, in the midst of his term of office, to return into your hands the dignity conferred upon him. Our regret at the necessity for such a step remains profound; and I am sure that you will wish me to convey thus publicly to Mr. Douglas the assurance of your sympathy, and of your earnest wishes for his speedy and complete recovery and future prosperity.

As you are, doubtless, also aware, our esteemed Secretary, Mr. Bennett, has during the last few months been laid prostrate by a serious illness, from which he is happily to a considerable extent restored. While congratulating him upon his recovery thus far, we have it in our power to testify, in the most practical manner possible, to our regard for one to whose exertions the Association is so greatly indebted, by assisting in the work of this meeting when assistance would be of service, and by the exercise of as much forbearance as possible during the continuance of it.

During the past year we, as an Association, have lost, through death, five of our number. These are—Mr. George Berry, formerly and for many years Manager of the Ashford Gas-Works, in Kent; Mr. A. F. Livesay, formerly part Proprietor of, and otherwise officially connected with the Ventnor Gas-Works, Isle of Wight; Mr. F. W. Brothers, late Manager of the Chorley Gas-Works; Mr. H. S. Pierson, formerly Inspector of Mains in the service of the Chartered Gas Company; and Mr. Claudio Gil, of the Gas-Works, Barcelona; all of them most worthy representatives of the profession to which they belonged. It is fitting here to record also the death of one who, although not a member of the Association, yet took a warm interest in its welfare, as in everything connected with the gas industry. It was only last year that we had to lament the loss of the familiar reporter of our proceedings; and now the keen, yet kindly critic is gone from amongst us. Mr. W. T. Fewtrell, F.C.S., whose death we now deplore, took for several years an active part in the management of the JOURNAL OF GAS LIGHTING, succeeding, in a great measure, the late Mr. T. G. Barlow. His intimate knowledge of chemistry rendered his criticisms upon the subject of gas manufacture of especial value; although his name will probably be held in remembrance chiefly as co-Editor with Mr. Newbigging of "King's Treatise on Coal Gas," the most valuable and comprehensive work of the kind yet attempted.

If the present total number of members be compared with that for the year 1870, when it was 314, it will be seen that the Association has considerably more than doubled during the past ten years, proving it to be possessed of an amount of vitality greatly in excess even of that with which the manufacture of gas is ordinarily credited. Nor will it be found upon examination that its augmented usefulness suffers in comparison with this great accession of numbers. Year after year fresh fields for investigation have been opened up, new problems have been presented for solution, until there is hardly a detail, intimate or remote, of the complex art of gas manufacture that has not been made the subject of free, exhaustive, and instructive criticism. Our discussions have made of individual knowledge one common stock; our published Transactions will be found to be a faithful reflex of, almost without exception, the most advanced opinions upon all technical matters relating to gas. These annual gatherings afford to the gas manager more and more favourable opportunities for throwing off that crust of isolation by which he is apt to be enveloped, and for freeing himself of crudities that are so often engendered by a life of comparative self-dependence. It is not necessary that his voice should have been heard at these meetings; he may have been a mute participator in our proceedings; yet, if he has not returned to his work improved by contact with his professional brethren, quickened in his desire to do the best that he can both in and for his calling, he will have proved himself to be insensible to one of the most powerful appeals that could be addressed to him. Such, in brief, has been the work of the Association, and such may it long continue to be.

My object, however, in thus referring to it is not one of laudation merely; there is, as may be readily imagined, a reverse side to this pleasing picture, which I conceive it to be equally my duty to place before you. Some there are amongst us who do not feel entire satisfaction at the past career of the Association, and who desire to mould its future more in accordance with their views of an enlarged sphere of usefulness. With these it is impossible not to feel a certain amount of sympathy. There can be but few who, looking back along the road they have travelled, have not to recall some opportunities disregarded, some aspirations unfulfilled. As with the individual, so it may also be with the Association. It is objected that its aims have been metropolitan rather than cosmopolitan; its actions mechanical rather than progressive. Towards the satisfying of a growing desire on the part of members for more frequent opportunities of discussing matters of immediate importance, it has made no effort; and hence the formation of District Associations; of sections, bound to it indeed by the strongest ties of sympathy, but owning to it no other allegiance than that which is secured to it by the force of superior numbers, position, and influence. In the conduct of its affairs it has adhered, without sensible variation, to its original programme; our annual volume, while increasing in bulk and, let me add, in value also, remaining what it was at the commencement—a report solely of the proceedings of two, or at most three days in every year. There seems to be no good reason why, except perhaps on the ground of expense, this should not be made of still greater value to us all. Following the example of similar Associations, it might, through the instrumentality of a Committee of Publication, be constituted a complete record of the progress of gas manufacture in all parts of the world. This would be accomplished by the selection, and translation where necessary, of such extracts from both British and foreign journals as might, in the opinion of the Committee, possess a permanent interest in relation to gas. In this way we should be kept informed semi-annually, or oftener if found desirable, of the advances made in connection with gas lighting abroad, and

at the same time be building up for ourselves an epitome, for reference, of the most valuable and comprehensive kind. In another direction also it seems possible that we might with advantage imitate the practice of kindred societies—namely, in the encouragement and prosecution of original research. I am not unmindful of the fact that the Association has in its gift at least one medal, besides premiums at will, and that in the bestowal of these it is unlikely that the claims of the meritorious investigator could be overlooked; yet do we not fail somewhat in our aims by not giving, to a certain extent at least, point and direction to the labours of the latter, and by abstaining, in our collective capacity, from all attempts at elucidating some of the apparent mysteries of gas manufacture? Such, at any rate, are among the suggestions that occur for extending the usefulness of the Association; and I venture to hope they may not be deemed unworthy of your consideration.

Whatever of truth there may be in the saying that "London is not England," certain it is that its gas polity is reflected far and wide, possessing an interest extending beyond even the limits of the realm. Here was first made conspicuously apparent the failure of active competition when applied to gas undertakings; and here also, following within the space of a few brief years the rejection of this principle, was first accepted, in its most comprehensive sense, the very opposite one of amalgamation. It is not necessary to justify the combinations that have taken place, and of which we cannot yet have witnessed the last, by pointing to reductions of price that have followed, or are expected to follow; their advantage has been made apparent enough during the past few years by the disappearance from crowded neighbourhoods of works that could not but be inconveniently and uneconomically conducted. The growing requirements of an overflowing population had, in fact, rendered amalgamation a necessity altogether apart from financial considerations; yet the concentration of manufacture in the most suitable localities thus made possible, must of itself, from its greater economy and the higher degree of skill that it admits of, have eventually secured great and lasting benefits to the consumers, had they only possessed what has been called the "magic of patience" to await its fruition. Gas legislation, however, like Parliament itself, seems destined, every few years, to undergo a more or less complete revision; and in the fulness of time, albeit precipitated by events that need not now be recalled, it was considered desirable to stimulate the action of the Companies towards further reductions in the price of their gas. The introduction of the sliding scale of dividend is recognized as having been mainly the work of one of our Past-Presidents, and now an Honorary Member—Mr. George Livesey; and it is an achievement of which he may justly feel proud. Without of necessity endorsing every argument that was advanced in support of so great a change, it may be accepted, at this distance of time, as the first, as it remains the only attempt to apply to what, in the hands of companies, are essentially commercial undertakings, sound commercial principles; and for this reason, if for no other, any endeavour to disturb it would be a matter for regret. Nevertheless it is to be apprehended that the public will regard with increasing jealousy augmentations of dividend for which only a bare justification can be shown to exist. The permanence of the sliding scale as an institution depends, it may be said, upon its good behaviour. It may be expected to continue in favour so long as it operates, or is believed to operate, more for the benefit of the consumer than the legislation that it superseded; but it might quickly fall into disrepute upon the production of evidence of the superiority of the latter, or, in other words, if it could be shown to have retarded rather than have accelerated what may be called the natural progress of reduction. Whether, in such an event, the acquisition of the gas undertakings, in trust for the public, would be further promoted by parliamentary action, it is perhaps, notwithstanding the recent correspondence upon the subject, premature to consider.

Public attention has now for a lengthened period been directed to the claims of the electric light to be considered, under its most recent aspects, as a rival to gas for the general purposes of illumination. Ever since the discovery, almost contemporaneously with the invention of gas lighting, of the conversion, under certain conditions, of electric energy into light, this possible means of illumination has attracted to itself the very highest scientific intelligence. For nearly the best part of a century the names of many of our most eminent men of science have been identified with efforts for its development; and it is, therefore, not at all surprising that its advocates to-day are men upon whom we are proud to say have fallen the mantles of Faraday and of Davy. But what, it may be asked, is the position which has been secured for it, and what are the prospects with which it has been endowed? Have we any greater reason to fear in it a rival now than at any past period of our history? Are we entitled still to term it the *ignis fatuus* of modern philosophers? or has it, in the words of one of the most distinguished of these, after having been in dreamland for sixty years, now come into the world of realities? These are questions that concern our future; and although we may reasonably believe that in the main they are in course of practical settlement in favour of gas, yet a brief consideration of them may not seem altogether undesirable.

It is evident, then, that the electric lamp, for ordinary indoor purposes, has yet to be invented. Notwithstanding the sensational announcements that have from time to time been sent to us from across the Atlantic, no advance whatever has been made towards the adaptation of the light to domestic requirements. It is not, however, to be inferred from this, or from the many failures that have occurred, that therefore, in the present state of the science, the lighting up of moderately large interiors is impracticable. On the contrary, evidences of its practicability are of no recent date. As an example, I may recall to your remembrance the illumination, some time ago, of the Hippodrome, in Paris, than which anything of the kind more charming in its general effect it is difficult to imagine. The impression left upon my mind by that enormous building, flooded with light in every part, by that sea of faces, every lineament of which was, so to speak, distinctly visible, will not soon be effaced, and has reconciled me to much of the enthusiasm which the new light invoked. The Paris *Salon*, also, has this season, and for the second time, been lighted up upon the Jablochkoff system, in a manner that has called forth a large measure of approbation. Many efforts in the same direction have likewise been made in this country—efforts, it is true, for the most part of brief duration; yet becoming more persistent and continuous; and, so far, illustrating the possibility of successful illumination. There is no need to inquire too closely into the causes that in so many instances have led to the abandonment of experiments auspiciously commenced. These may have been various; but one that has been patent to all is the intolerable flickering and unsteadiness inherent in almost every lamp that has yet been introduced. As an instance of the extent to which this interferes with the efficiency of electric lighting, I may mention the results of some observations made not long ago, at my instigation, of the effect of a Jablochkoff "candle" in full combustion, placed within a clear glass lantern. These disclosed a rapid variation in the light afforded; the difference in the areas of illumination, many times repeated within the space of only two or three minutes, being represented by the proportions of about 9 to 4; that is to say, that while the observer was able, at one time, to see to read at a distance of 203 feet from the lantern, almost immediately afterwards the light became so contracted that he could only see to read the same print at a distance of 132 feet. This experiment was continued for some little time, and by three different observers, with practically the same results, although, as was to be expected, the distances arrived at by each were by no means the same. Within doors this defect has usually been overcome in a great measure by placing the lamps sufficiently close together to allow their circles of illumination to completely overlap; but so expensive a remedy is of itself an efficient barrier to the employment of any system depending upon it. Much attention, however, continues to be given to a matter of such vital importance; and not long ago there was exhibited, among others, in this hall * an improved form of lamp, the invention of a Mr. Crompton, which is said to combine steadiness with simplicity of action. This lamp, it is understood, is already in use in Glasgow and other places; while the improvements that have been made in the Werdermann incandescent burner has secured for it a place among the competitors in the interesting trial that is about to be conducted at the Opera House in Paris. The Brush system also has been introduced into this country from America, where, according to report, it has met with considerable success, and has been applied, amongst other uses, to the lighting of underground workings. It is not easy for us to conceive of the adaptation of any system of electric lighting to such a purpose; but I need hardly say that we, of all sections of the community, are interested in the highest degree in all that concerns the safety and comfort of the miner, and are prepared to welcome with satisfaction and thankfulness any means by which they may be rendered

* Institution of Civil Engineers.

more secure. So far, therefore, from grudging to electricity this field of usefulness, we would say to it in all sincerity, "Go on, and prosper."

The cost of production of the electric light per candle is, according to the most reliable evidence, so absolutely governed by the magnitude of the light evolved, and the ultimate value of the latter is so entirely dependent upon the use that can be made of it, that it seems impossible to arrive at any fixed notion with regard to it in comparison with that of gas. All that we know with any degree of distinctness is, that its superior economy has never yet, unless for very special purposes, been demonstrated, either in this country or, I will venture to say, out of it. It is true, we have heard much, and are probably destined to hear more, of the cheapness of its production on a large scale, say in a 6000-candle lamp; but then it is apparent that such cheapness may be bought too dear, and that in the application of such a powerful light all, and more than all of the advantages of economical production may readily disappear. This, in practice, is found to be the case, and hence it is that systems producing lights of lesser magnitude continue to be preferred, although costing very much more, in consequence of, to use the words of Mr. Preece, the "terrific waste" of subdivision. It has, however, been claimed for these that, in their adaptation to the requirements of factories and other similar buildings, they possess an advantage over gas in the matter of cost; but here again there is little or no reliable data; and it will be found that in the majority of cases other reasons than that of economy have determined their adoption. Such comparisons, too, as have been made, have invariably, and perhaps of necessity, been between the cost price of the one means of illumination and the selling price of the other; forgetful of the fact that in the same way might gas itself be proved to be cheaper than gas. It was only the other day, for instance, that I heard of a large manufacturer, having gas-works of his own, who is making gas mainly for the sake of the coke that he produces, which is valuable to him in his manufacture, and with which it is evident that he is by no means overstocked. It is clear that his gas is costing him very much less than it would do if he obtained his supply from the Local Authority or Company; and this, although probably in a much less marked degree, is doubtless the position of many who prefer to be their own producers. But such experience by no means suggests the advisability of every consumer following the example of these economists; this impracticable alternative being very far removed by the development of a system that has hitherto remained unsurpassed for convenience and adaptability to the requirements of the greatest number. What is really to be considered, then, is, not so much whether electric lighting is or is not going to supersede gas in this large building or in that, or whether, for certain purposes, it may not find extended employment; but rather the possibility or otherwise of its expansion into a system at all comparable with our own. In this view our interest in the efforts of electricians continues to be centred almost wholly in the experiments upon the Thames Embankment, where alone has there been any practical attempt at determining the problem of distribution. This being a matter upon which so much of the future of electric lighting depends, the engineers in charge are justly entitled to the credit of having scored a considerable success in proving, as has been done during the last few months, the practicability of the transmission of the electric energy, without appreciable loss, to nearly twice the distance originally contemplated; although to us, who are accustomed to send our gas through systems of mains of hundreds of miles in length, it seems a very small matter indeed to make an extension of a few hundred yards or so.

The bolder spirits amongst electricians, however, are at the present time meditating far loftier flights, calculated, in their opinion, to exalt electric lighting into the regions of economical science. Dr. C. W. Siemens, whose name has long been honourably associated with the progress of science and industry, both in this country and also abroad, has proposed the transmission of electric energy on a scale far exceeding anything that has yet been attempted. He has arrived at the conclusion that a copper conducting-rod, 2 inches in diameter, would suffice to convey 1000-horse power to a distance of 30 miles. We are not concerned as to the initial power that would be required to produce this effect, nor as to the means by which it would be obtained, whether by the agency of steam or by the subjugation of a waterfall. What interests us mostly is the indication the proposal affords of the possibility or otherwise of successful distribution in competition with coal gas. It is probable that such a conductor would not cost, in ordinary times, much less than £100,000, or, let us say, about that of a 24-inch gas-main. There is, it is true, no precise parallel to such a length in gas distribution, the nearest approach to it being probably the case of the Beckton works, where it is understood the gas is transmitted to a distance of 15 miles before distribution; but our knowledge of the subject enables us to discuss such a project as one that is entirely within the bounds of practicability, and with regard to which a tolerably exact calculation can be made of the effect. Assuming, then, an initial pressure of, say, 6 inches, or that of most gas-holders of any size, it will be found that a 24-inch main is capable of delivering to a distance of 30 miles, and between two level points, a sufficient quantity of 17-candle gas for an effective illumination of about 220,000 candles, when consumed during one hour. On the other hand, the value of the 1000-horse power has to be variously estimated. If expended in conjunction with lamps of large power, which for ordinary purposes are simply impracticable, it may be said to represent an illumination of 1,200,000 candles; if applied to the more practicable Jablochkoff system, we should expect to get an available illumination of about 230,000 candles, or much the same as in the case of the gas. This, however, it may be fairly assumed, is the maximum effect to be expected from the copper conductor, whereas we know perfectly well that the rate of delivery through the gas-main could, by means of common enough appliances, and at a very trifling cost, be enormously, if not indefinitely increased, to say nothing of the accidental assistance that might be afforded by rising ground. Regarded, therefore, merely as a question of transmission, and taking no account of the fact that the minimum delivery of the gas-main would represent, if converted into power by the gas-engine, more than three times the ultimate effect of the copper conductor, it is evident that gas lighting has nothing whatever to apprehend from the facility of conduction of electric energy as illustrated by the proposals of Dr. Siemens. So that, when we are threatened with a competition that is to be brought about by the utilization of waste water power, we may confront dream with dream; ours, not perhaps the least possible of realization, being of the time when the waste gases from innumerable coke ovens shall be collected, purified, and stored for the use of the nearest towns; or, further yet into the future, when gas manufactories on a gigantic scale shall be established in the heart of our principal coal-fields, for the purpose of furnishing the means of light and heat to our great centres of population, in much the same way as the water supply is in course of being dealt with by the bold and sagacious projectors of the Thirlmere scheme.

While occupied in this way in observing the front of our position, a more potent, because a more insidious adversary claims attention in our rear. Considering all the advantages that gas lighting possesses and is able to offer, it may upon first thoughts appear to be a little absurd to describe the inconvenient oil lamp as a powerful competitor; and yet to this dignity must it be acknowledged that our apathy has too frequently raised it. Ever at hand to a very numerous class of consumers as a possible and cheap alternative, its manufacture has become an important, and continues to be an increasing industry, with an effect upon our own that cannot fail of being almost correspondingly opposite; so that, at a time when so much is being done to establish for gas new uses, it is important to inquire how far its primary use is restricted by the protective policy just now so much the fashion. The returns that have been most kindly furnished me, and which I take this opportunity of acknowledging, reveal the fact that there is, in most towns, a very wide field for the employment of gas for illuminating purposes, untouched, because for the most part avoided, by gas enterprise. They show that, in 40 large towns, having populations of not less than 40,000, in which what is known as "common" gas is supplied, the consumption per head of population varies from 2000 to 4600 cubic feet per annum, the average being 3197 cubic feet, while the proportion of consumers to tenements differs more widely still, being, in the 20 towns respecting which I have been able to obtain complete returns, from 28 to 91 per cent., with an average of 59·25. In only two instances is the percentage more than 76, and in only eleven is it over 60. It might be superficially assumed that these variations are the effect of population, price, or habits; but the returns make evident the existence of an influence more powerful than these. For example, there are two neighbouring towns, similarly constituted, but one more than twice the size of the other, price and quality being much about the same in both, in the smaller of which has been developed a consumption far exceeding per head of

population that of the other, with a percentage of consumers actually more than double. In this instance a less generous treatment of the consumer in the larger town stands plainly enough in the way of an augmentation of business of fully 60 per cent. Again, in one very small non-manufacturing town, not included, on account of its size, with those I have just referred to, there is a percentage of consumers of 70, and a consumption per head of population of 3500 cubic feet; in striking contrast with a manufacturing town more than twelve times its size, in which the percentage is only 34, and the consumption 2500. I do not know what may occur to you as a reasonable explanation of such an anomalous condition of things; but I believe that I am in possession of a sufficient, although by no means a satisfactory one. The fourth question in my circular was, "What is your rule with regard to deposits or guarantees?" and the answer to this from the smaller of these two towns is eminently simple and straightforward: "No deposit or guarantee." The other reply is to be interpreted as expressing considerable confidence in the principle of "money down," and a determination to uphold it; so that here are illustrated two distinct lines of policy, with their attendant results—the one founded upon ordinary business faith and business practice, the other upon suspicion and mistrust, probably without a parallel in the commercial world. There are, however, open to gas managers the famous "three courses." In addition to what may be called the repellent and the neutral, of which I have furnished examples, there is also the attracting. At the head of my list stands a large manufacturing town, having 91 per cent. of consumers, and a consumption of a little over 4600 cubic feet per head of population. What is the reply in this case to question No. 4? I will quote a portion of it: "Cottages supplied under agreement with the landlord, who becomes responsible for payment of gas consumed by his tenantry, and on the aggregate he obtains a discount varying with the amount," &c. I need not follow my correspondent in the table of discounts that he has been kind enough to send me; that is a matter of detail less interesting than the principle involved, and the lesson we may derive from its application. This lesson I take to be that gas undertakings are not exempted from the conditions that govern the success of all commercial enterprises, except in so far as a beneficent Legislature has shielded them from the ill effects of a mischievous policy; but that liberality, combined with caution and sagacity, is certain to meet with a full reward, not only in the shape of assured profits, but also in the approbation of the consumers; in short, that as we sow so may we expect to reap.

It cannot, however, be said that either the possible or the actual rivalry to which I have referred, however they may at times have disturbed the serenity of the prospect, have hitherto affected our material prosperity. With very few exceptions, the price of gas is at the present time lower than at any former period, while full dividends continue to be secured. Nor are there any indications of our being spoilt by success. On the contrary, there probably never was a time of greater activity for progress, if one is to judge from the number of what may be called "burning questions" that await solution. Prominent among the many subjects that are at the present moment engaging our attention may be enumerated the proper application of heat to the retorts, the principles that govern economical condensation, the substitution of machine for hand labour in the retort-house, and the desirability, not to say the necessity, of measures for extending and popularizing the uses of gas.

The question of economy in the consumption of fuel is one that has never by any means pressed heavily upon the English gas maker. Fortunately for him and for England, fuel has continued, with rare exceptions, to be both cheap and abundant; so that, in many localities, the enforced production of coke has from time to time proved a source of considerable embarrassment. Even in places not unfavourably situated for its disposal, the problem of how to get rid of it has been sadly debated, and various ingenious devices have been resorted to for the purpose of presenting it in a more attractive form to the consumer. Under these circumstances, it could hardly be surprising if economy were the exception rather than the rule, and that it is otherwise may be regarded as distinctly creditable to those who practise it. It is, however, quite conceivable that a striving after excellence in this particular may be carried too far; and that a liberal, but at the same time an effective expenditure of fuel may, after all, turn out to be the truest economy. So, at least, would seem to be the opinion of our Continental and American brethren, for their settings have for years been worked at a temperature exceeding anything that has hitherto, except, perhaps, here and there, found favour in this country. They appear, in fact, to have made deliberate choice of increased production as against a low fuel account; their make per mouthpiece, with retorts of an ordinary size, being commonly from 7000 to 8000 cubic feet per diem, with an expenditure of fuel varying from 30 to 40 per cent. of the coke produced. If, then, as is to be reasonably inferred, this policy of high heats be successful with fuel at prices that we should consider excessive, what chance could it have of failure where fuel is a drug, seeing that it offers the double advantage of increased and profitable consumption and diminished production?

While, however, the principle itself is receiving but tardy recognition here, already the means by which its advantages have hitherto been secured are, in Germany at least, in a great measure superseded. The large combustion chamber, forming, as it were, the core of the German setting, is, in most modern constructions, giving place to the gas-producing furnaces of Oechelhäuser, Liegel, Grahn, and others. The idea of applying heat in a gaseous form to gas-retorts is by no means new. It is now many years since Dr. Siemens proposed the employment of his regenerative furnaces for this purpose, and they were so applied in at least two English works. It is perhaps unnecessary to recall the circumstances that led to their ultimate abandonment in both instances; suffice it to say that their fuel economy was satisfactorily demonstrated. A trial of them made almost simultaneously at the Paris Gas-Works proved more fortunate for their permanence; for there they have since, in a modified and improved form, been adopted in all extensions. Those of us who have visited these works—and many availed themselves of the opportunity afforded them two years ago—are able to testify to the admirable heats maintained by this system—obtained, it is stated, with an economy over the solid fuel system sufficient to cover the extra cost of construction in one year and a half of constant work. It is not, however, easy to become reconciled to the somewhat elaborate application of the regenerative principle, which forms so prominent a feature of the arrangement; and this, perhaps more than anything else, has hindered the general acceptance of this description of furnace. However desirable the utilization of waste heat may be under all circumstances, it has never come to be regarded amongst us as an object of the first importance, or as one to be pursued to the exclusion or sacrifice of other considerations. The Germans, although under a greater necessity for economy in this respect than ourselves, have practically adopted the same view, by seeking, in their gas-furnaces, to make the regenerative principle subservient to, or a useful adjunct, rather than an essential feature of their arrangements. Thus, the exhaust flue, which is frequently placed underneath their settings, instead of, as with us, upon the top, is to be found cased with an outer brick lining, between which and the flue the air supply to the furnace is drawn; and in this way much of the heat that would otherwise be lost by radiation is made use of in a simple and inexpensive manner. Some of the most successful of their furnaces will be found to bear a strong resemblance to the gas producer of M. Tessié du Motay, employed in America for the production of water gas, a description of which was given in *Engineering* of Dec. 12, 1879, and April 23, 1880. This, as will be recollected by those who have seen the description, is of a very simple construction, having, in lieu of grate-bars, channels at bottom formed of fire-brick, from which is to be inferred the absence of any serious amount of clinkers. Others, again, have much wider openings, and are furnished with grate-bars, after the manner of the Siemens furnace, both kinds being used either with or without an air or steam blast; and the object of all of them is to form a deep mass of incandescent fuel, so as to ensure the decomposition of as large a proportion as possible of the carbonic acid generated by combustion.

It is perfectly evident that the employment of these furnaces, either wholly or only partially detached from the bench of retorts, must involve a very considerable loss of heat through radiation; and their economy notwithstanding would seem to be a serious reflection upon the solid fuel system. That they are economical, however, there appears to be little room for doubting. The last report of the German Continental Gas Association, for instance, makes prominent mention of the fact that it has been decided to adopt them throughout the whole of their works. At Cologne, where entirely new works have, within the last five years, been erected by the Municipality, under the guidance of their Engineer, Herr Haganer, the whole of the retorts are heated by this method, the consumption of fuel being stated to be as low as 22 per cent. of the coke produced, with an

economy of labour, owing to the facilities for firing and comparative absence of clinker, of no less than 40 per cent. These works, I may observe, will well repay a visit by any of the members of the Association who may be passing their holidays abroad, for they combine some of the best features both of English and of continental practice. When I called there two summers ago, I was received with great kindness by Herr Haganer and his assistants, and the hour or two that I spent in their company tended, in no small degree, to dissipate any insular prejudices on the subject of gas-making that, up to that time, I may have entertained. Throughout the works are to be found evidences of a thoughtful appreciation of the most advanced appliances, with a general arrangement very superior to what is ordinarily to be met with at home. It is scarcely necessary to inquire whether the question of gaseous *versus* solid fuel was considered in connection with any extension in this country contemporaneous with that at Cologne, but now that our attention has been fully aroused to the importance of it, it is not too much to expect that something decisive will be speedily achieved. Meanwhile, the first fruits of real work will be made apparent to-day in the papers on the subject by Messrs. Frank Livesey and G. E. Stevenson, whose example it is to be hoped will find many imitators.

From the heating of the retorts to the disposal of the coal within them is a natural, if not in all respects an easy transition. High temperatures require to be followed up by well-ordered systems of charging and drawing. The sufficiency of hand labour, in point both of economy and of efficiency, has long been questioned; but it cannot be said that the principle of mechanical stoking has found by any means a ready and complete acceptance. Our attitude towards it hitherto may be described as one of cold neutrality. It is true, the desirability of employing machinery has been almost universally admitted; yet no sooner has the fertile brain of an inventor conceived of a way by which this might be accomplished, than the onus of proof has been cast upon him, almost without reserve, or a helping hand. The effect of this has undoubtedly been to retard progress; nevertheless, sufficient has been established to justify our regarding the subject as one within the range of practical gas politics. In particular, the past year has been distinguished by the advent of a new aspirant for honours, in the person of our ex-President, Mr. Warner, whose efforts and ingenuity we all hope may be crowned with success; while it has also been remarkable for the first competitive trial of distinct systems within the same works. Without entering into the respective merits of the various systems that are now offered for our acceptance, it may be observed generally that their success seems in a great measure to be proportioned, in the first place, to their departure from the ordinary method of treating the coal; and, in the next, to the observance of the conditions which experience has shown to be conducive to the best results in carbonizing. For example, in the earlier stages of its introduction, many fruitless attempts were made to improve the prospects of machinery by adapting the settings to its somewhat arbitrary requirements; whereas to-day we are witnesses of what may be called, without undue emphasis, a double triumph, in the combination of very simple machinery with a most admirable setting. Again, every endeavour to deal with the coal in the exact condition in which it is received into the works, or in which we have been accustomed to manipulate it, has resulted, more or less, in failure, for the sufficient reason, apparently, that the work of filling the scoop has seldom been attempted, and has never been satisfactorily accomplished. Now, however, this, the very pith and marrow of the difficulty, it is shown can be overcome by the simple expedient of breaking up the coal, so that it would seem as though we have only to satisfy ourselves that this may be done without injury to results, to ensure the removal of perhaps the only real obstacle in the way of the introduction of almost any form of mechanical appliances.

In the consideration of these important matters, the exercise of caution has been abundantly manifest; yet in another direction will be found evidences of mutability scarcely in harmony with its influence. It will appear that, in the opinion of the well informed, we have, during a series of years, and upon slender grounds, been pursuing, with reference to condensation, a course of procedure the very opposite of that which sound knowledge would dictate, or a regard for our own interests recommend, and that we are now invited to turn from the error of our ways, and retrace our steps. It is not so many years ago since the practice of conveying away the tar separately from the hydraulic main was general, not to say almost universal; but, in the course of time, and in obedience to a necessity that arose for the prevention of naphthaline deposits, this came to be reversed, in many instances the plan being resorted to of carrying the entire products of condensation, for a considerable distance, measured by temperature, along with the gas. This was so far successful, not only in the fulfilment of its original purpose, but also, according to many, in the improvement that was apparent in the illuminating power of the gas, that the speedy and general acceptance of the principle of the horizontal condenser followed almost as a matter of course. It is true the enrichment of the gas by its means rested, and may be said still to rest, upon evidence of a somewhat indeterminate character; nevertheless, there is the fact that the stated results have not in any one instance been disproved. Whether the correct reason has been assigned for them is an entirely different matter. It is by no means either singular or impossible to be right in practice and yet wrong in theory. Success in the one is not incompatible with inaccuracy in the other. When, therefore, it is suggested, however faintly, that we should abandon that which experience has shown to be in some degree beneficial, for the reason, among others, that our theory is at fault, a little hesitation is not only excusable, but at the same time desirable also. It may be at once admitted that the opinion which has hitherto prevailed as to the beneficial effects of contact between gas and tar is, without qualification as to temperature, untenable. It was, in fact, discredited almost before it was conceived; and the more recent experiments of Mr. Young and others appear to have fully confirmed the earlier ones of the Rev. W. R. Bowditch, which first disclosed the almost opposite fact of the injurious effect of such contact except at certain high temperatures. How, then, are we to reconcile this with our practice? To me it seems that we have neither been altogether right in this matter, nor altogether wrong. Our perception of the truth at the beginning has simply failed us towards the end of the process of condensation; but in our operations we have been shielded from much of the harm that might otherwise have resulted from this by the adaptability of the horizontal condenser to the purpose for which it is required. It is impossible, when speaking upon condensation, not to refer to the admirable series of articles, by Mr. R. H. Patterson, that appeared in the JOURNAL OF GAS LIGHTING a few months ago. It is only scant justice to acknowledge the important service that has been rendered to gas manufacture by his clear and able elucidation of a somewhat abstruse and difficult subject. Mr. Patterson, it is needless to say, is agreed in condemning the principle of what may be called indiscriminate contact; but, what perhaps is equally interesting, he is by no means emphatic as to the efficiency of the means by which this is commonly sought to be promoted. He is, in fact, unable to discern any particular virtue in the horizontal condenser. On the contrary, it would seem to be the vertical form that possesses the best claims to be preferred. We are reminded by him of a circumstance that bears with some importance upon the determination of this question. Notwithstanding the great separation that takes place in the hydraulic main, there still remains with the gas, as everybody knows, throughout the whole of the subsequent process of condensation, and, in fact, until finally eliminated in the washers or scrubbers, a quantity of heavy tarry particles, that injure the gas by absorbing, or becoming dissolved by the light naphthas, and which it is consequently desirable should be got rid of as speedily as possible. Now, with regard to these, what is it reasonable to suppose takes place in the condensers? In the horizontal, on the one hand, the products of condensation may be expected to form a small stream along the bottom of each pipe, into which all tar, as it condenses, would naturally sink, and be covered over with the lighter oils and weak ammoniacal liquor. On the other hand, as pointed out by Mr. Patterson, the sides of a vertical pipe become coated, not alone with the lighter oils, but also with these objectionable tarry particles, which, in their course from the top to the bottom, present a continually changing surface to the gas, with a result that may be imagined. On this supposition the efficiency of the horizontal condenser not only does not depend upon the presence of the products of condensation throughout its entire length, but would really be increased by their removal as the temperature becomes diminished. As ordinarily employed, its effect may be described as beneficial at the higher temperatures (say above 80° or 90°), in so far as it permits of contact with the light naphthas, undisturbed, so to speak, by the presence of the heavy tar; and serviceable at the lower temperatures, in so far as it may be the means of avoiding contact with the products of condensation.

The proposals, however, that are now made to us possess a

wider significance than can attach to the somewhat vexed question of what is the best form of condenser. Whatever system be preferred, there inevitably remains with the tar much that would enhance the illuminating power of the gas, if only it could be practically applied to the purpose. This it is now proposed to do, either by the maintenance of a temperature, at or near the hydraulic main, sufficiently high to prevent the union of the light naphthas with the tar, or by re-heating the latter, so as to restore the naphtha to the gas. The advantage thus to be derived can, of course, be determined accurately only by experience. Against the permanent gain in illuminating power would have to be set the first cost of plant and of carrying out the process, besides the lessened value of the tar consequent upon the abstraction of some of its most valuable constituents; but that the financial results are not unsatisfactory may be inferred from the increasing favour with which the various apparatuses now under consideration have come to be regarded. In the St. John Carburetter and Purifier, as it is called, the invention of an American engineer, and which has been employed, not alone in America, but also in this country for several months past by Mr. T. O. Paterson, at the works of the Rochdale Corporation, we seem to be furnished with a direct proof of the actually beneficial effect of contact between the tar and gas at a temperature considerably below that of the outlet of the hydraulic main; while in the case of Messrs. Aitken and Young's Analyzer, the application of extraneous heat is said to be productive of a yet more complete economy. It is also to be inferred, from no mention being made of it, that the difficulty to be apprehended from having to deal with the tar in a much more viscid state than is usual, either has not arisen or has been overcome; so that, the question being before us in a fairly practical shape, it may be desirable to consider how far, at any rate, the essence of the proposition may be imported into our ordinary practice.

We learn, in the first place, that the heat which is usual in the hydraulic main, although, so far as it can be made use of, beneficial, is insufficient to maintain the complete separation of the lighter oils. Next, that the heat determined upon as adequate for such maintenance should be kept up, as nearly as possible, for a period long enough to admit of the deposition of all heavy tarry matter. Thirdly, that all liquid products should be drawn off before the temperature has been sensibly reduced. Lastly, that means should be taken to eliminate, while the temperature is still moderately high, those tarry particles that would otherwise be carried forward with, and do injury to the gas. These conditions observed, the subsequent process of cooling will probably be a matter of comparative unimportance, care being taken not to pursue it too far. Whether they are such as can be practically applied is a question that can only be decided by experiment. Mr. Patterson has suggested that the temperature in the hydraulic main might be raised to the required point, say about 190°, by the aid of steam; and he would avoid the formation of pitch, if this were to be apprehended, by employing a shallow, or the Livesey hydraulic. It is to be feared that he would find his preventive of no avail. Shallow hydraulics—at least so far as I have had experience of them—however useful they may be in preventing the accumulation of certain forms of carbonaceous matter, are powerless against a sufficiently high temperature for the formation of pitch, for they only choke up the sooner for being shallow. This, however, by the way. There is little reason for supposing that a moderate increase of temperature could not be maintained without inconvenience, but the necessity for any extraneous assistance may well be doubted. It ought not to be difficult to render available for this purpose the enormous reserve of heat within the retort-bench below, by regulating the amount of radiating surface between the mouthpiece and the hydraulic main; or, in other words, by adapting the retort fittings to our requirements. Another way would be by raising the heat of the retorts themselves, by which plan a double advantage would be secured. By either method, or by a combination of the two, it should be possible to attain to the desired temperature in a way at once simple, direct, and practicable; and this, coupled with a system of condensing-pipes, inclining towards the hydraulic main, yet leading from it, would apparently secure much, although perhaps not all of the advantage of supplementary appliances. It will, at all events, appear probable, upon careful consideration, that the practical limits of the application of what it may not be incorrect to describe as the strictly scientific method of condensation are within the reach of simple and admissible modifications of existing means.

In return for the permissive rights, neither excessive nor extensive, without which the business of a gas undertaking could not be carried on, many restrictions have been imposed upon gas companies. It is hardly to be supposed, however, that these have been deliberately intended as fetters upon their industry; but that some of them have operated as such there is little room for doubting. In a significant article upon coal gas illumination, *The Times* newspaper has recently remarked upon the comparative apathy shown by English gas makers with regard to the employment of gas by the consumers. We may go further, and admit that there is little indeed to be found, on the part of our leading gas companies, of recognition of the principle of community of interests between manufacturer and consumer such as so freely obtains in the enlightened administration, say, of the Paris Gas Company. If it should be inquired why it is that in this country the consumer meets with so little encouragement in his desire to avail himself of the convenience and economy of gas, the answer will be that the law has set bounds to the operations of the companies which they cannot pass; the sanction of the Imperial Parliament—of Queen, Lords, and Commons—being necessary to render legal the sale or manufacture by them of even a single cooking-stove. It will be naturally and correctly inferred that, inasmuch as such sanction would cost both money and effort to obtain, success being at the same time by no means assured, and dividends tolerably secure without it, there is little inducement for enterprise in this direction. *The Times* has said truly that "they manage these things better in France," for, in the arrangements that are in force in the sister capital for promoting the intelligent use, not only of gas, but of gas products, it is impossible not to recognize the beneficial results of a policy having for its object the control of these industrial monopolies for the mutual benefit of all concerned. It is true, there has occurred a period when the perception of our rulers may be said to have been temporarily awakened to the desirability of establishing improved relations between the companies and the public, resulting in the adoption of the sliding scale. It is true, likewise, that the description I have given is by no means susceptible of general application. During the last few years a great change has taken place. In some few instances, under the authority of Parliament, in more numerous instances without such authority, or with authority ill defined, much is now being done for the spread of information amongst the consumers; and in the many exhibitions of gas heating and lighting apparatus that continue to be held in all parts of the kingdom, are to be recognized the gradual breaking down of a barrier created by jealousy on the one side, and by indifference on the other, and the re-uniting of interests that ought never to have been considered apart. May we not venture to hope that the liberality of the new Parliament will be exercised in acknowledging the efforts that are thus being made, and in cementing this most auspicious union, by the passing of a general Act, in the shape, it may be, of a further amendment to the Gas-Works Clauses Act, empowering all gas companies, and corporations possessing gas undertakings, not to manufacture, for this is neither necessary nor altogether desirable, but to sell or hire to their consumers, under reasonable limitations, any apparatus that it may be found convenient or economical to employ in connection with the consumption of gas. By adopting this course much unnecessary expense in the procuring of special Acts would be avoided; the position of gas manufacturers with regard to the subject would be clearly defined; while it could not but be acceptable to the makers of the apparatuses in question, from the prospect that would be held out to them of a widely extended market for their wares.

It is not, however, to be denied that very much may be done without any direct legislative enactment. The gas maker who waits to be made good, if I may be allowed the expression, by Act of Parliament, is in much the same position as the waggoner in the fable appealing to Hercules. There has never, in reality, been anything to hinder him from endeavouring to instruct his consumers in the economical uses of gas, nor from bringing under their notice the most modern and approved appliances, supposing him to have been so minded; nor are there at the present time any obstacles in the way of the fulfilment of this obligation, if such it may be termed. The way has been ever open to him to effect, by precept and by example, very much of the good that is expected to be achieved by projects of a more or less ambitious character; but the consequence, primarily, perhaps, of legislative restrictions, but mainly of the tacit acceptance by the companies of the position assigned to them, that of gas makers pure and simple, has been to divorce the science of the application of gas from that of its manufacture. The loss to the consumer from this unnatural

separation has been, without exaggeration, enormous. In the matter of light alone, it is almost a trite observation that very many have continued for years to pay 20, 30, and even as much as 50 per cent. more than they need have done had they been under the guidance of sound advice in the choice of burners. How useful to them would be a permanent exhibition of apparatus, after the model of those in Paris, or the services of a skilled official attached to each sufficiently large undertaking, specially qualified to advise them on all matters relating to the uses of gas; and what a valuable acquisition might not such an one prove to his employers, although not deriving his authority from any Act of Parliament.

Perhaps the most successful example on record of the direct application of heat as a mode of motion is furnished by the modern gas-engine. The recent development of this, after a succession of efforts, is one of the achievements of our time, and bids fair to secure for it a high place in the industrial annals of the century. Its progress has been watched with lively interest from two opposite standpoints. On the one side, gas makers have noted with satisfaction the promise of an additional source of future increase; while, on the other, the electrician has almost brought himself to regard it as a means through which the supremacy of coal gas as an illuminant may be vigorously disputed. It would be strange if the weapons furnished by ourselves should ever come to be effectually employed against us; yet this, in the opinion of some, is not beyond the limits of probability. In the minutes of evidence taken last year before the Select Committee of the House of Commons on Electric Lighting will be found abundant testimony in favour of the economy of the gas-engine, while at the same time the economy of the manufacture of the gas itself is sought to be discredited; so much so that, on reading them, one is almost tempted to imagine that henceforth the continuance of its manufacture is to be justified only for such purposes as that of furnishing motive power for the "light of the future;" or, at any rate, that this is to be its position when the electric light shall have been perfected and established. Even upon this supposition, however, consolation is left to us in the reflection that we shall remain the purveyors of a fuel which, in point of cheapness and convenience, it ought to be difficult, if not impossible, to surpass; and which, if ever the occasion should arise, might enable us to supply, without fear of competition, even the electric light itself. But there is little necessity for indulging in speculation of this kind. The time is obviously far distant, if it ever is to come, when coal gas shall be valued less for the light than for the heat that it affords. What chiefly concerns us in such a probability, remote though it be, is the refutation it furnishes of the plea so influentially urged against gas manufacture, that it is, comparatively speaking, an uneconomical science. It is scarcely to the purpose to be told that coal converted into electric energy can be made to produce much more light than it is possible to obtain from an equal weight when subjected to destructive distillation. It would be absolutely condemnatory of electric lighting if this were not so, seeing that in the one process the entire quantity of coal is reproduced, or is represented in the form of light; whereas, in the other, only a fractional part is converted into illuminating matter. This, however, does not of itself settle the question of comparative economy, the ultimate determination of which is influenced by a variety of considerations which it is unnecessary to discuss. It is somewhat more to the point to urge, as a reason why gas should be employed for the production of light, indirectly through its conversion into electric energy, rather than directly by means of the ordinary gas-burner, that only in this way can be utilized to its fullest extent the heat generated by combustion; but here, again, practical considerations prevail, and so long as it is found desirable to retain the present system of gas lighting, so long also may it be expected that the unavoidable expenditure of heat by which it is attended will be endured, even if it be not rendered more and more subservient to general requirements. Meanwhile we may wait with perfect equanimity the coming to the front of this question of heat or light, because already the economy of gas manufacture for the sake of heat alone has been amply vindicated. In the gas-engine we have means by which the gaseous products alone are able to exert an effect equal to that of the entire weight of the coal required for its production when expended upon an ordinarily well-constructed high-pressure non-condensing steam-engine. That is to say, taking 18 feet of gas to be the consumption per indicated horse power per hour of the gas-engine, which is a little in excess of what is found to be required in the largest of them, and 4 lbs. of coal as the consumption of the steam-engine, the one would nearly enough represent the gaseous products of the other, while the actual weight of material consumed by the two engines would be in the proportion of about 1 to 6. Doubtless a much smaller consumption with the steam-engine than 4 lbs. per horse power is readily attainable; yet the greatest economy that has ever been secured by the aid of elaborate and costly contrivances still leaves the proportion, weight for weight, as about 1 to 3 in favour of the infant gas-engine—this child of great promise.

It is, of course, open to remark that the 18 feet of gas cost more than the 2 lbs., or even the 4 lbs. of coal; and so they do to the consumer, who willingly pays, in the shape of profit to the manufacturer, for the advantages he enjoys in the use of the gas-engine; but for our own requirements its superiority in all respects would seem to be beyond question, having regard to the almost nominal cost of gas in most cases. We do well to bear in mind also that, in according to it such a practical recognition, we are helping forward an agency that may be destined to exercise a powerful influence upon the fortunes of our industry.

Just now I hinted at the possibility of bringing more under control the heat generated during combustion when the gas is used for illuminating purposes. This heat, although a source of comfort rather than otherwise to the majority of consumers, stands very much in the way of the extended use of gas in confined spaces, and in houses of the better class, where also, it is needless to say, the products of combustion constitute a real objection. No doubt the proper remedy for this is efficient ventilation; but unfortunately the practice of this most necessary art is "more honoured in the breach than in the observance." Left to our own resources, however, the difficulty is not by any means a formidable one. What is known as the "Benham" system has long been applicable to the majority of cases; and Mr. Sugg has recently introduced what may be recognized as a modification of this, for use in connection with his large Argands. These latter have also rendered especially practicable the employment of a simple form of chandelier furnished with a central tube, by which the entire products of combustion may be carried off, and either disposed of in the nearest flue, after the manner of the "Benham" system, or they may be made use of for heating an upper room by means of a radiating stove or a simple coil of piping. There is probably nothing particularly novel in such an arrangement, but it satisfies, at a moderate cost, the conditions considered necessary to comfort by a numerous and influential class of gas consumers, while at the same time it opens up a way for the utilization of heat that would otherwise be worse than wasted.

Heating by gas having come to be regarded with increasing favour, improved appliances follow almost as a matter of course, although much remains to be done. Gas fires, for instance, are still for the most part but indifferent imitations of a cheerful coal fire, except in their inevitable waste by way of the chimney; and yet their use is rapidly extending. It may be inferred from this that their employment would become much more general if the resemblance could be rendered more complete; or, better still perhaps, that the heating agency of gas might speedily enjoy a fuller recognition, if the tastes of the public would admit of our dispensing altogether with the art of imitation, and relying solely upon the intrinsic merits of the fuel that we have to offer. The waste, even in the most approved forms of gas-fires, cannot amount to less than from 20 to 25 per cent., and ought to furnish a strong argument in favour of the substitution of stoves by means of which the whole of the heat generated might be applied to the purpose for which it is required. It is satisfactory to note that advances are being made in this direction, and amongst others of recent introduction may be mentioned the "Adams" and the "Ritchie" stoves, as, although proceeding on different lines, complying in a high degree with the conditions essential to the combination of economy with efficiency.

Although so much is being done for these subsidiary uses of gas, it is not to be supposed that the original, and what in all probability will, for a long time to come, be the main purpose of its manufacture, has in any degree been overlooked. Improved burners furnish one of the most satisfactory evidences of recent progress. The principle of controlling pressure at the point of ignition, as a means of obtaining higher and uniform results, is becoming widely acknowledged in the many excellent combinations of regulator and burner by which, without additional cost for the gas, increased comfort may be dispensed to every household; while the prospect of rivalry has stimulated into being, for

outdoor purposes mainly, burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the flat-flame burner into a lighting medium of a very high order, and for his vindication of its claims to practical consideration; although with Mr. Sugg remains the honour of being the most successful expositor of the illuminating power of coal gas. I have had occasion to refer to the theoretical disproportion between the heat of burning gas and the light evolved. Whether this heat may be regarded as the measure of the light that will ultimately be obtained, it is perhaps impossible to say; but certain it is that the limits of progress in this direction have not yet been reached. Every successive investigation reveals the possibility of further improvements, and the enlargement of the Argand by Mr. Sugg has furnished a development of light unequalled by any other form of burner. Some of the latest results show an improvement of fully 15 per cent. over anything previously attained, and upwards of 30 per cent. in advance of the Referees standard burner. It is not necessary to dwell upon the significance of this discovery. It may be tendered as one answer out of many to those who would assign to gas lighting, in the immediate future, a secondary position, as a science outstripped in the march of progress; it may be accepted by ourselves as an assurance, if such were needed, of the rich reward that continues to await the patient and intelligent investigator.

ROTHERHAM CORPORATION GAS SUPPLY.

The Appropriation of Gas Profits.

At the Meeting of the Rotherham Town Council on Wednesday, the 2nd inst.—the Mayor (Alderman Harrison) in the chair—the Gas Committee reported that the profit realized on the gas undertaking during the past year, subject to audit, was £3300. The Committee agreed that, with the consent of the Council, the sum of £2750 should be placed at the disposal of the Finance Committee. This latter Committee, at their meeting on the 26th ult., decided to recommend the Council to appropriate the sum as follows:—General district rate account, £898 9s. 4d.; borough-fund account, £800; and markets account, £1051 10s. 8d.

Mr. Taffinder asked the Chairman of the Committee if the decision to place £2750 at the disposal of the Finance Committee had been arrived at by the Gas Committee unanimously. He also said that it would have been more satisfactory, at all events to the gas consumers of the borough, if a portion at least of the sum had been appropriated to making a reduction in the price of gas.

Mr. Walker also protested against the appropriation of the profits for the good of the rates, and said that it was unjust to the gas consumers, and, according to the ruling of the Lord Chief Justice, illegal; as this authority had ruled that corporations were not entitled to work any of their undertakings for profit, but must sell their commodities at the lowest prices. With regard to the injustice of the thing, he pointed out that in the outlying portions of the borough the ratepayers had the benefit of reductions in the rates, although they did not contribute to the profit made in the gas department. There were also four of the principal firms of the town who made their own gas; they were collectively rated at £5200, and if the proposed arrangement were carried out their rates would be saved to the extent of about £120 a year.

Mr. Wragg thought if Mr. Walker's idea were acted upon, the large firms of the town would be driven out of the borough, and the Council would be killing the goose that laid the golden egg. He also pointed out that the Corporation at present supplied Greasborough and Rawmarsh with gas, and if a reduction in the price were made in the town, those districts would also ask for similar terms.

Alderman Morgan said that when the gas-works were purchased the rates had to be mortgaged as security for payment, and as the ratepayers came forward to help the Council out of the difficulty, he considered they had a perfect right to let them participate in the profits. If the profits were not appropriated, the Council would have to levy a rate of 3d. in the pound, and the result would amount to nearly the same thing; at all events, the difference would be only about ½d. in the pound.

Mr. Neill contended that it would be unfair to allow the gas consumers alone to participate in the profits of the gas department. It would be unfair to saddle the users of the town water with the deficit on the water-works, and the same would apply to the markets question; and they must take the three departments into consideration. It would only be the time to make reductions in the changes when they were possessed of a surplus which accrued from the management of all three undertakings.

The minutes were then adopted.

ROCHDALE CORPORATION GAS SUPPLY.

The report of the Gas Committee of the Rochdale Town Council, for the twelve months ending March 25 last, has just been issued. The Committee report an increase in the consumption of gas during the year, amounting to 3,800,000 cubic feet, against a decrease of 600,000 cubic feet the previous year. Owing to the low prices which ruled for house coal, the coke receipts were slightly under those of the previous year; but the surplus profits exceeded those of any previous year. They amounted to £8886 0s. 8½d., after deducting £1922 for payment of the St. John purifying apparatus, concerning which the Committee say: "The increase in the profits this year is accounted for mainly by the introduction of a new apparatus known as the St. John Purifying Apparatus and Carburetter, and also to an increase in the consumption, and to a considerable saving in the general working expenses. The object of the St. John apparatus is to entirely free the gas of all particles of tar, naphthaline, and a considerable quantity of sulphuretted hydrogen and ammonia; but the principal object your Committee had in view when purchasing this apparatus was to be able to manufacture 18-candle gas with a smaller percentage of cannel than had hitherto been practicable. The report of your Engineer and Gas Examiner on experiments made with the apparatus previous to its being purchased, showed that it was capable of removing tar, naphthaline, a portion of sulphuretted hydrogen and ammonia, and of carburetting or enriching the gas to the extent of 1½-candles, and they estimated that in one year a profit of £772 would result. It is satisfactory to find that in six months winter working a saving has resulted of £870, owing to the large reduction in the consumption of cannel rendered possible by the use of this carburetting machine, the standard of illuminating power having been maintained throughout. From the results obtained by this apparatus during the period of working, it may be fairly estimated that in one year the saving will not be less than £1000."

The report further states that the Committee are about to arrange for the fixing of governors to equalize the pressure in the higher parts of the district, and are having the services laid on the box system. The present number of consumers is 14,743, showing a decrease, during the last twelve months, of 902. The number of meters in use is 18,845 wet, and 99 dry ones. During the year the illuminating power of the gas was tested daily, the average for the quarters ending June, September, and December, 1879, and March, 1880, being 18·38, 18·20, 18·22, and 18·10 candles—an average of 18·22 candles. During the same four quarters the consumption of gas varied as follows:—29,214,100, 27,611,400, 88,429,900, and 77,560,600 cubic feet. The average quantity of sulphur in other forms than sulphuretted hydrogen, over the whole year, was 24·62 grains per 100 feet of gas.

We have received from Mr. T. O. Paterson, the Engineer of the works, the following statistics in reference to the gas supply:—

	March 25, 1878, to March 25, 1879.		March 25, 1879, to March 25, 1880.
Receipts.			
Gas sold to private consumers	£38,237 2 3½	..	£38,865 0 9
Gas supplied to public lamps	4,369 1 8	..	4,391 10 0
Tar and ammoniacal liquor	3,017 11 2	..	3,082 17 1
Coke	2,507 14 8	..	2,184 16 5
Sundries	80 0 0	..	24 14 3
	£48,211 9 9½	..	£48,548 18 6
Expenditure.			
Cannel and coal used	£17,360 10 8½	..	£15,980 1 4½
Lime used	166 3 3	..	—
Salaries and wages	7,640 19 11½	..	7,195 9 0
Expended on works, &c.	3,688 18 6½	..	4,554 3 3
Printing and stationery	144 8 1	..	122 8 0
Interest of money	7,291 17 0	..	7,242 0 8
Rates and taxes	1,346 4 1	..	1,789 18 3
Rent of land	160 6 11	..	385 13 7
1-75th part of money borrowed paid off	2,393 3 8	..	2,393 3 8
	£40,192 12 2½	..	£39,662 17 9½
Profit this year	8,018 17 7	..	8,886 0 8½
	£48,211 9 9½	..	£48,548 18 6
Production.			
Cubic feet of gas sold to private consumers	202,826,800	..	207,604,500
Do. estimated to have been burnt by street-lamps	13,806,900	..	12,947,600
	216,633,700	..	220,552,100
Cubic feet of gas consumed on the works	2,304,200	..	2,263,900
Do. lost by leakage, &c.	25,810,100	..	26,983,000
	244,738,000	..	249,799,000
Loss per cent. by leakage and condensation	10·541	..	10·801
Tons of cannel used	6,674	..	4,238
Do. coal used	18,125	..	20,602
Total coal and cannel used	24,799	..	24,840
Average price of cannel per ton at works	19s. 11·019d.	..	19s. 7·618d.
Do. coal per ton at works	11s. 9·011d.	..	11s. 5·689d.
Cost of Gas.			
Net cost of gas per 1000 feet, reckoned on quantity sold, including 1-75th part of debt paid off	3s. 2·317d.	..	3s. 1·401d.
Net cost of gas per 1000 feet, reckoned on number of feet made, and excluding 1-75th part of debt paid off	2s. 7·570d.	..	2s. 6·722d.
Selling Price of Gas.			
Invoice price of gas per 1000 feet in the borough	£0 3 11	..	£0 3 11
Do. do. out of the borough	0 4 7	..	0 4 7
Street-lamps—price charged per lamp per ann.	2 10 0	..	2 10 0
Amount of discount allowed	2,184 10 2	..	2,385 13 1½
Number of consumers	15,267	..	14,743
Capital Account.			
Amount borrowed, including depreciation-fund	£214,413 2 11	..	£214,413 2 11
Amount repaid in previous years	35,607 3 5	..	38,000 7 1
	£178,805 19 6	..	£176,412 15 10
Amount repaid this year	2,393 3 8	..	2,393 3 8
Amount owing, including depreciation-fund	£176,412 15 10	..	£174,019 12 2
Deduct depreciation-fund	9,063 2 11	..	9,063 2 11
Present mortgage debt	£167,349 12 11	..	£164,956 9 3
Total cost of works, including purchase expenses, as per last year's report	£204,478 18 2	..	£208,152 18 9½
Extensions, as per stock account	2,034 0 7½	..	660 18 9
	£206,512 18 9½	..	£208,813 17 6½
Total amount paid off	38,000 7 1	..	42,033 10 9
Present value of works	£168,512 11 8½	..	£166,780 6 9½
Balance of debts and stock on hand	20,919 1 8½	..	21,125 6 1
	£189,431 13 5	..	£187,905 12 10½
Deduct mortgage debt, &c., as above, also amount allowed out of revenue as depreciation	181,412 15 10	..	179,019 12 2
Profits paid to Finance Committee this year for benefit of ratepayers	£8,018 17 7	..	£8,886 0 8½
Do. previously paid	105,868 14 10	..	113,887 12 5
Total paid to Finance Committee	£113,887 12 5	..	£122,773 13 1½
Town Lamps.			
Number of lamps	1,751	..	1,766
Number of hours the lamps have been lighted	2,106	..	1,965
Main-Pipes.			
Length of main-pipes laid this year, in yards	2,688	..	1,129
Length previously laid	125,270	..	127,958
Total length laid to date	127,958	..	129,087

1872—Amount allowed out of revenue as depreciation of old works . . £1000.
1873 Do. do. . . £4000.

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